This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

7. 604

600011006E

27.

[illegible] in ancient towns of Nantes, [illegible] and many more in the north, with [illegible] in the central and southern parts, beyond [illegible]: by the plea of ignorance added to that of necessity; while, for Holland, throughout, necessity is a paramount plea. But the example and the knowledge of Italy were open to the whole world; and as little was medical and statistical information in such a condition as to have admitted any excuse for St. Lucie and New Orleans; as for endless other settlements, equally [illegible], in almost every European colony and conquest throughout the world.

But not to extend examples of this nature, it must be admitted that convenience and necessity often produce strong pleas in favour of a bad [illegible], or of a persistence in the original bad choice of the many whose ground has been occupied. Specimens of this pernicious nature are [illegible] the most fertile and the most populous, [illegible] maritime ports or sea- [illegible]

er into the political calculation. Yet
views of public economy, this is a
serving of consideration. Human
, after all, the end and object of all
t and commerce; and in acting thus,
the object of pursuit in pursuing
ecurity of life less necessary to
try, than security of propert
the legislating founder of
ensure by direct laws, what
e very roots. And thus also do
on security of life, depend, mainly
d good conduct; since, in human his-
noted truth, that the maxim "let us
k for to-morrow we die," becomes, in
an situations, the too common rule of
Were it necessary to prove our own
this subject, I might quote, what I
th safety, Prince of Wales's island;
more pleased to pass from suc

here dispersed the remarks on t
cesses against Malaria, by bring
xta-position with the particular
o which they are applicable, it
t avoid the repetition which m
l th of a separate cha

J.H. 1827.

MALARIA:

AN ESSAY

ON THE

PRODUCTION AND PROPAGATION

OF THIS POISON,

AND ON THE

NATURE AND LOCALITIES OF THE PLACES

BY WHICH IT IS PRODUCED:

WITH AN

ENUMERATION OF THE DISEASES CAUSED BY IT,

AND OF THE

MEANS OF PREVENTING OR DIMINISHING THEM,

BOTH AT HOME AND IN THE NAVAL AND MILITARY SERVICE.

BY JOHN MACCULLOCH, M.D., F.R.S., &c. &c.
PHYSICIAN IN ORDINARY TO HIS ROYAL HIGHNESS PRINCE
LEOPOLD OF SAXE COBOURG.

BIBLIOTHECA BODLEIANA

LONDON:
PUBLISHED BY LONGMAN, REES, ORME, BROWN, AND GREEN.

MDCCCXXVII.

604.

PRINTED BY J. TEUTEN,
BERWICK STREET, OXFORD STREET.

ADVERTISEMENT.

The present volume has, in conformity to the advice of better judges than the author, been separated from two subsequent ones containing the history of the diseases, of a remittent and intermittent nature, which are admitted to be the produce, chiefly, of Malaria. Those two volumes, which will shortly appear, will be found to comprise an account, generically, of marsh fever and of Neuralgia; one volume having been allotted to each: the former including an account of numerous disorders dependent on intermittent or remittent, the characters and treatment of which have been often misapprehended, while the latter, under a new and generic view, connects Neuralgia, in all its forms, with intermittent: treating of various diseases, original or consequential, which appertain to this as a generic affection, and pointing out a systematic plan of cure for the whole of a train of disorders, of the most distressing and refractory nature.

It has necessarily followed, that in the present Essay, or Volume, there is a deficiency of illustration as to the disorders in question, since it is chiefly trusted to the medical ones; but to have altered this, would have caused repetitions which would have enlarged the bulk, and increased the expence, to at least the medical readers. To them it will therefore be a work of three volumes; while the present part remains an essay in one, for those who, as travellers, or as residents in unhealthy districts, or from whatever other causes, may possess an interest in a subject of this nature, which they could not be expected to take in a medical treatise, however popular the subject, and however it has been endeavoured to render it intelligible, as well as interesting, to every class of readers.

CONTENTS.

CHAPTER I.

Introductory remarks on the effects of Malaria, and on the utility of a knowledge of that subject. - - 1

CHAPTER II.

Nature of the evidences respecting the production of Malaria in situations of a less notorious or acknowledged character. - - - - - - - 15

CHAPTER III.

Of the soils and situations which most commonly produce Malaria. - - - - - - - - - 35

CHAPTER IV.

Of the soils and situations less conspicuously productive of Malaria or as yet unsuspected of it. - - - 52

CHAPTER V.

On certain obscure or disputed cases relating to the production of Malaria. - - - - - - 132

CHAPTER VI.

On revolutions and changes which take place with regard to the production of Malaria, whether from natural causes or from artificial sanitary measures. - - 177

CHAPTER VII.

On the propagation of Malaria. - - - - - 212

CHAPTER VIII.

On the climates and seasons peculiarly favourable to the production and propagation, or the effects of Malaria. 337

CHAPTER IX.

On the Geography of Malaria. - - - - - 366

CHAPTER X.

On the Nature of Malaria - - - - - - 419

CHAPTER XI.

On the general effects of Malaria upon the constitutions of the inhabitants of marshy districts, and on the diseases which seem to be produced by it. - - - 428

ERRATA.

Page 23, *line* 8, *for* observations, *read* observation.
—— 25, — 14, *for* their, *r.* that.
—— 28, — 3 from bottom, *for* this, *r.* the.
—— 33, — 14, *dele* even.
—— 54, — 8 from bottom, *for* exciting, *r.* exhibiting.
—— 65, — 1, *for* no, *r.* not.
—— 159, — 8, *for* allow, *r.* allows.
—— 162, — 10, *for* as, *r.* us.
—— 165, — 17, *for* Serivus, *r.* Servius.
—— 168, — 10, *for* now, *r.* how.
—— 295, — 3 from bottom, *for* dimished, *r.* diminished.
—— 388, — 5, *for* Cephallonia, *r.* Cephalonia.
—— 409, — 8, *for* emigrants, *r.* immigrants.

CHAPTER I.

Introductory remarks on the effects of Malaria, and on the utility of a knowledge of that subject.

It has long been familiar to physicians that there was produced by wet lands, or by marshes and swamps, a poisonous and aeriform substance, the cause, not only of ordinary fevers, but of intermittents; and to this unknown agent of disease the term marsh miasma has been applied. Nor is such knowledge confined to physic. Throughout the world it is a fact known to the vulgar, and even to less enlightened nations; familiar to the Negroes of Africa, familiar to the lower orders of France, Italy, Holland, and elsewhere, and not less known to at least our own rural population occupying districts of this character; since every labourer in Lincolnshire or Essex believes that his ague is the produce of his fens, if neither he nor his physician is so well aware, as both ought to be, that his common fever of summer or autumn has the same source, and if neither inquire, with sufficient care, where this pernicious land is present, and this poisonous substance generated.

This is the unseen, and still unknown, poison to which Italy applies the term that I have borrowed, Malaria. This is the cause of fevers, both ordinary and intermitting; but it is the cause also of other disorders, scarcely less important in point of numbers and of mortal power. Such are dysentery and cholera; and yet all these united form but one portion of the enormous mass of disease, of suffering, and of mortality dependent on this single cause.

Of this I shall hereafter give the most ample demonstration: since I trust that I shall be able to trace to this great source of evil a large proportion out of the whole of the chronic disorders which are the causes of such extensive suffering and wide inconvenience; while it is already known that there are some dependent on this cause, which occasionally terminate in lingering and protracted death. Still further, I think that I shall be able to prove it a widely acting cause of what are called nervous disorders; the most common, probably the chief, source of the most painful diseases to which mankind is subject, of which one at least is familiar under the term *tic douloureux;* and, lastly, the far most frequent source of those innumerable ailings called, in the ordinary language of society, ill health, by which are especially persecuted those who inhabit certain situations in our own country, as in many others.

How widely Malaria is a cause of death, will be apparent almost on a moment's consideration, when we recollect, that, in all the warmer, and thence more populous, countries, nearly the entire mortality is the produce of fevers, and these fevers the produce of Malaria. I have said elsewhere, that it has been estimated to produce one-half of the entire mortality of the human race; nor do I think that this computation, made by physicians of care and consideration, has been exaggerated. If in our own more fortunate climate it is less destructive, it is far more so than is commonly imagined; since, of those who die from fevers, it may safely be asserted, that more than nine in ten perish from the fevers of this class, too generally confounded with the contagious disorder of the same name, under the term Typhus. And if the deaths produced in England by fevers, in this present season alone, 1826, be examined, if I could name a single parish, and that not a peculiarly unwholesome district, where, in a population of sixteen hundred, the mortality, in two months, was one in thirteen, we have surely abundant reason, if far less than our neighbours of France, Holland, and Italy, to take an interest in the cause of such diseases, had we even no other motive; and the more particularly if, by an accurate knowledge of the cause, we can avert its power, or diminish its influence, and thus reduce this heavy account of human suffering, with all its complicated consequences.

But if, from having heard this term habitually coupled with the name of Italy, from erroneous views of the nature and causes of the fevers which I have here noticed, and from similarly mistaken ones respecting a vast body of other disorders, there are persons who imagine that England is by nature exempt from this scourge, let them return to its statistical and medical history for two centuries past, and then see what was the mortality, not merely of England generally, but even of London, from this cause, Malaria. That a King of England should now die of a marsh fever, and that such a cause of death should excite no particular surprise, is an opinion not to be entertained for an instant. Yet thus died Cromwell, one among hundreds; the death indeed not without note, but its cause not esteemed out of the ordinary course of mortality. Far otherwise, indeed, would such an event be judged now; yet that which has been diminished, has not been extirpated. True; England is comparatively freed from this plague, and it has been freed from it by industry and attention; but it is not yet exempt; nor are we exempted from the further exertion of that attention to which it is owing that the fens of Lincoln are not the rivals in deadliness of Walcheren, and that Romney is not what are the Pontine marshes. But knowledge must precede industry and care; and knowledge also must teach us to prevent or diminish the evils where their cause is beyond our powers. Such knowledge it is the object of this essay to extend, or rather to teach; since, however once known, it appears to have been nearly forgotten, though never indeed understood as it ought to have been.

But if we will not be yet persuaded to look about us at home, let us look abroad, and not even to the tropical regions, but to France, and Spain, and Holland, and Greece, and Italy, and then ask ourselves whether the subject before us is not a subject of interest. The value of life, of survivorship, the average chance of approaching to the proverbial limit of threescore and ten, is the measure of the salubrity of a country, and that salubrity depends mainly on the presence or absence, the range or the limitation, of Malaria. We may take the average of life among ourselves, in round numbers, at fifty, with sufficient safety for this purpose. In Holland it is twenty-five; the half of human life is cut off at one blow, and the executioner is Malaria; for there is no other cause for the superior mortality of that country. But there are districts in France where it is but twenty-two, twenty, eighteen; so little is the chance of life; while all the instruments by which Death executes his office, are here superseded by one, by that one which renders all others unnecessary, which has monopolized the functions of the whole dark catalogue—Malaria. Let us turn to Italy: the fairest portions of this fair land are a prey to this invisible enemy, its fragrant breezes are poison, the dews of its summer evenings are death. The banks of its refreshing streams, its rich and flowery meadows, the borders of its glassy lakes, the luxuriant plains of its overflowing agriculture, the valley where its aromatic shrubs regale the eye and perfume the air, these are the chosen seats of this plague, the throne of Malaria. Death here walks hand in hand with the sources of life, sparing none: the labourer reaps his harvest but to die, or he wanders amid the luxuriance of vegetation and wealth, the ghost of man, a sufferer from his cradle to his impending grave; aged even in childhood, and laying down in misery that life which was but one disease. He is even driven from some of the richest portions of this fertile yet unhappy country; and the traveller contemplates at a distance deserts, but deserts of vegetable wealth, which man dares not approach,—or he dies.

Nor do even his houses and towns afford him a shelter against this all-pervading pestilence. It enters with him into his chambers, and stalks through his streets. Imperial Rome herself is its chosen victim: man flies before it, but the enemy is behind him and around him on all sides: every day sees the dominions of death extended, and the hour is impending when the Eternal City will cease to be, when it shall submit to that fate, which has been the fate of proud Nineveh, and Babylon the queen of nations.

Such also is Sicily, such Sardinia, and such is classic Greece. To live a living death, to be cut off from more than half of even that life, to be placed in the midst of wealth and enjoyment, yet not to enjoy, such is the fate of man in the lands of Europe where Malaria holds its chief seat; while in the tropical regions, it is to fall by thousands and tens of thousands, the summer harvest of death walking hand in hand with that of the vegetable world.

True; from thus much we are free; and we may be grateful for a security, purchased, as it is, by an ungenial climate, and a soil less productive. But I shall soon show that our exemption is far less perfect than we flatter ourselves; that we too suffer, and that we suffer from much which we might remedy or avoid. But can we forget that we also suffer with Italy and with Greece, with Africa and the West and the East, with the entire world? As travellers, as residents, as warriors, as colonists, we partake with all; and as they suffer, so do we. Let residents, let travellers, let colonists say if it be not so. War at least cannot forget what it suffers, what it has suffered, from this cause; from that Malaria of which it is too often ignorant, which, too often it thinks fit to despise. If the sword has slain its thousands, the Malaria has slain its tens of thousands. It is disease, not the field of action, which digs the grave of armies; it is Malaria by which the burning spirit, fitted for better things, is quenched, and in the coward's bed of death. This is the Destroying Angel, the real pestilence which walks at noon day; and to which all the other causes of mortality are but as feeble auxiliaries in the work of destruction. This is Malaria, the neglected subject to which I am desirous of calling attention, that, by this, its powers may be diminished: Malaria, from which even ourselves, here in England, are not free, though, from ignorance, unaware of it, or, from unwillingness to receive conviction, shutting our eyes to the truth.

What other causes may here act in producing this incredulity, let others say; yet let me make one remark at least, while the explanation I will as gladly leave to others.

It is a characteristic moral feature of those who reside in such unhealthy situations in France, and a fact noticed by every one who has examined those districts, to deny strenuously the existence of danger; and to maintain that neither the soil which they inhabit, nor the air in which they die rather than live, nor their modes of life or labour, are unwholesome. Always ready, and even ingenious, in excusing the place of their nativity or residence, they invent any other cause for their diseases, rather than confess or believe in the true one; and are even indignant at those who would attempt to convince them, as if that were a reproach and a calumny. This is not the feeling of Italy, it is true, more enlightened on this subject, or at least it is a rare one; but it is a very general one in Holland, as to which country it will perhaps excite a smile in particular, to know that the people of Walcheren repelled with no small indignation, at the time of the celebrated visit of our troops, the charge of unhealthiness which was brought against their beloved birth-place.

Nor is it less true of our own country, as I have said, if under some difference of aspect and manner, perhaps, also, under some difference of feelings. If ignorance cannot see, vanity, habit, unwillingness to learn, or whatever else, supporting themselves also on the general ignorance of the mass of practitioners, is ever ready to deny the presence of Malaria in the indicated place, as it equally refuses to believe that any disorder, which is not a vulgar "ague," in its most vulgar sense, can be the produce of this cause. Far steadier is this obstinacy when the place in question is not a marsh, since beyond a term do vulgar minds never reach; while, should it be a fish-pond, or the somewhat higher pretence, of the same nature, with which they who imagine themselves gifted with taste have projected to emulate nature, the clamour or contempt become rivals of the obstinacy, and the naturalist, who would demonstrate the identity, must be silent or yield—because marshy ground is not a marsh.

That what is popularly called a marsh is not necessary to the production of Malaria, is what I mean to show, and, I trust, to prove, in this essay; to prove that the causes of Malaria exist under numerous circumstances, not at all suspected, in our own country, and in thousands, tens of thousands, of places, even at our very doors. That it produces on the inhabitants, and from these very sources, the same general effects as it does in Italy or France, is what I also hope to prove; as I shall further show that its casual effects are the same, in the production of marked diseases, and that the fevers of our own island are, very predominantly, the marsh or remittent fever of the countries most subject to this plague, though inferior in severity. Thus, also, in the medical part of this work, or in the future volumes, if I shall prove that it is a frequent, if not the exclusive, cause of a variety of tormenting, painful, and dangerous disorders, as also of what is called ill health, very widely, I trust that it will no longer be a subject of doubt, still less of contempt; and that the consequence will be a considerable diminution of the evils which are produced by this plague, and by the soils or situations in which it is generated.

This is the useful end, and the object in view; correction of the cause, or, if that be impossible, avoidance. To know the exciting cause of a disease, is the first and most important step in practical medicine; it is to be furnished with the means of preventing what, unfortunately, we cannot always cure; pain which we cannot mitigate, or death which we cannot prevent. Avoidance is prevention, and, to a large extent, it is effectual. Better still is the abolition of the cause; but neither end can be gained, until our knowledge is accurate and complete.

And if Malaria is that cause which I shall prove it to be, of diseases numerically, and of instances of disease arithmetically, to an enormous and little suspected amount, then must this essay, if it be as true as I conceive it to be, become an auxiliary to practical medicine, of an importance not less, at least, than would be a new and effectual mode of curing these disorders, including, as they do, some of the most deadly, as well as the most refractory, to which mankind is subject. And if thus, by prevention, effecting more than even a method of cure could do, so is it to an accurate and minute knowledge of the causes, of the exact spot, and of every spot, productive of

Malaria, that we must often resort, even for the means of cure; since it will be found, that the most obstinate of these disorders are rendered incurable by repeated but unsuspected applications of the cause, so that the mere avoidance of that becomes the cure.

And if this inquiry thus forms a necessary portion of the merely medical part of this work, not less will it prove useful to the people as a practical guide towards the avoidance of diseases, endless in variety of character as in variety of evil, and which, in the infinitely greater majority of cases, are the produce of this very ignorance; of want of knowledge, or want of suspicion, as to the existence or presence of Malaria. If they were thus taught but to avoid the fevers which, in most cases, are the produce of this ignorance, fevers which, in every summer, are committing their ravages even in our towns, and which a very little caution would often prevent, it would be no small gain; but when we add to this the endless list of other disorders, chronic or acute, the torments of entire families, or the cause of misery to individuals beyond numbering, the impediments to business and industry as to comfort and happiness, and all of these but too generally the consequences of similar ignorance, I cannot help thinking that to spread such opinions as widely as possible, and to enforce them as strongly as possible, is a duty, and a duty which will not fail to be rewarded at least by some success, hereafter, if not at present; while the only reward which has here been contemplated, is that success; the conviction of having aided in diminishing human suffering.

I must now proceed to describe the various facts which relate to the production and propagation of Malaria; but as I shall have to encounter abundance of incredulity or prejudice, it will be necessary to commence by stating the nature of the evidence as to the actual existence, in particular cases, of a poison, which is, from its very nature, invisible, which has hitherto entirely eluded all chemical investigation, and which can be detected only by its effects on the human body. This is a justice which is due to a reader; since no one can or ought to be contented with the mere assertions of individuals, however numerous or reputed, or whatever their own convictions may be; and it is the more necessary to the reader of our own country, since, on a subject never before submitted to an English public, it would be natural to expect, at least, both ignorance and incredulity, did we not even know that there were also prejudices in abundance to be surmounted.

CHAPTER II.

Nature of the evidences respecting the production of Malaria in situations of a less notorious or acknowledged character.

It is admitted on all hands, that what is called a marsh or a swamp, is capable of producing fevers; and, in our own country, this is more especially believed respecting the intermittent ones, or, as they are popularly termed, agues. This particular class of causes, or localities, will require, therefore, no such proofs as I am here contemplating, though they must be included in the general enumeration.

It is not so, however, with regard to all; and in enumerating the less admitted sources of Malaria, I shall, therefore, be often compelled to resort to proofs of some delicacy, and to appeals to an experience for which, be it received as it may, I must be very often myself responsible. It becomes, therefore, necessary, as a preliminary step, to state the reasons from experience, whence particular soils or qualities of land, many of which have hitherto been unsuspected, have been here judged productive of Malaria; and where these observations have been multiplied, as has here been the case, there is no reason why we should not generalize for the several causes of this less obvious nature, as has been done in the case of marshes. And if the generalization is not universally true, if exceptions shall be named, as they doubtless exist, it must be remembered, that this is no more than happens with regard to even the most notorious causes, marshes and jungles, and to these, even in tropical climates, as will be shown hereafter more particularly. In all cases of philosophy, exceptions occur, until we are masters of all the causes that produce and influence an effect; while, instead of proving the rule, as is commonly said, they prove that we do not know that rule; and if there are exceptions in this particular case, it is no ground for surprise, ignorant as we in a great measure are, of the precise part or action of a soil which generates Malaria.

It is a fundamental falacy in this case to limit our decision on the power of any soil or situation in the production of this poison, by the occurrence of regular intermittent fever, or common ague; and yet it is a leading and a common fallacy, in our own country, even among physicians.

The practitioners acquainted with hot countries know indeed perfectly well, that the common fever of summer and autumn, be its names what they may, is equally the produce and proof of Malaria; as this is also known to all physicians of reading, who have not had the advantage of similar experience. To them it is equally known, that dysentery is produced by the same causes, while, at present, I need not extend this enumeration.

But this is as far from being true of the mass of domestic, untravelled, and imperfectly educated practitioners, as it is of the mass of the people themselves. With these, the fevers in question are most frequently called typhus, and, further, generally considered as contagious; such is the laxity still prevailing, almost, I might say, universally, on this subject; of which, if it were not disagreeable to recollect, and painful to recal to the minds of those in fault, one notorious instance, among innumerable others, not very distant in time or place, and noted for its severe consequences, might be quoted; while the term bilious fever, sometimes used by others, conveys ideas no further definite, particularly as the cause is generally sought in heat, cold, fatigue, fruit, even in plums and cherries specifically, and while the autumnal dysentery is attributed to the same fanciful causes.

Having, therefore, set aside this fallacy, the real conclusion to be drawn is, that wherever remitting fevers, or fevers of whatever nature that are not contagious, as well as dysenteries (to say nothing at present of other diseases less commonly attributed to this cause), are produced, the proof of summer Malaria is as complete as if the same soils had, in spring, produced ague; or, generally, that as the same soil, in different seasons, or under different circumstances, produces both kinds of disease, or the different species of one genus, while both are mutually interchangeable, so the occurrence of any species at any season, is a proof that the situation is productive of Malaria.

Now, to apply this to the desired proof, as to the poisonous quality of unsuspected situations, it will be found by any careful observer, that there are certain determinate places, where nevertheless no marshes are present, in which there are annually, or generally, fevers produced or existing, while others, even in the immediate vicinity, are exempt; and, in these places, a careful inquirer will find that some one of the various circumstances of soil shortly to be pointed out, is present.

Further, and to come to a more delicate and a scarcely observed species of proof as to the presence of Malaria in certain situations, it is quite notorious that some places or soils are, in general terms, unhealthy; a remark as familiar with the people at large as with medical practitioners. Thus it is a vulgar remark, that in certain houses or places, a family is rarely without some sickness; or, to use the strong but coarse language in which it is generally stated, "that the apothecary is never out of the house." It is almost equally familiar, that families, which had before been healthy, have become the reverse on changing houses or situations; as, in the opposite cases, that they have recovered health by change of residence. Of such facts as these, there is no observer who must not be able to recollect numerous examples.

As may be expected, there is seldom any backwardness in assigning causes for the unhealthiness of such places; since the lowest of the ignorant are not less fond of causation, in their own way, than philosophy itself. Thus, to be damp, to be low, and so forth, are obvious physical facts, and easily accused as causes; while medical men, with an unpardonable carelessness, or absence of reasoning, too generally rest in the same vague and indefinite language, satisfying themselves, as is too common, with words. Thus it also is, that we find even those from whom we should expect more accuracy of thinking, concluding that a given situation or district is unhealthy, and even without asking themselves what are the diseases of this ill health, because the soil is clay; or reversely, healthy, because it "lies on a gravelly bottom," or is a land of chalk; concluding, when they do conclude at all, that clay is a pernicious substance, or resting in some vague and loose notions about moisture, cold, porosity, drainage, or what not.

This is a pernicious laxity, both of thinking and phraseology, because it turns the attention from the real evil, and, preventing the discovery of the true causes, equally impedes that of the remedy. To anticipate, but no more than is here necessary, what must shortly be said on the subject, if a gravelly soil is healthy, it is because its easy drainage prevents the growth of that particular vegetation which is the cause of Malaria; and if a clayey soil is the reverse, it is because, by lodging superficial water, it generates, however partially, those marshy or undrained spots, or wet woods, or moist meadows, which are the sources of this poison, and, consequently, of the various diseases confounded under the vague term unhealthiness But as there are cases without end where gravelly soils do contain spots generative of Malaria, while clayey soils are, over large tracts, often as dry, and therefore as healthy, as the most porous ones, it is plain that this laxity, both of observation and language, is in every way pernicious ; since, from not seeing the real cause, it can never be decided where health may reside or disease be produced.

Now, to recur to this kind of "unhealthiness," as it is termed, attached to particular houses or situations, as affording evidence of the existence or generation of Malaria in places little suspected, or, rather, not at all suspected, and most generally denied, both by the inhabitants and their physicians, it will be found, on a rigid examination, that it consists very often in the occurrences of summer and autumnal fevers; a case, we might suppose, sufficiently evincing the real cause, were it not for the almost universal laxity of opinion among medical practitioners respecting the nature and causes of these fevers. But whether decided or marked fevers occur or not, it is usual for the inhabitants of such places to suffer, almost perennially, or with periods more or less durable, of tolerable health, from a vexatious and frequent recurrence of petty fevers, or of a general febrile state, very often referred to dyspepsia, to nervous ailments, or to any other convenient and fashionable cause; while this condition of the body, sometimes following decided and severe remittents, often occurs without them, producing that general and obscure continuance of ailment which is called ill health.

An acute and unprejudiced observer, taking this view as his guide, may easily satisfy himself of the real nature of the "ill health" in the situations now under review; but he will also find that this does not constitute the whole of the diseases thus produced; as, if he will review his own practice on such inhabitants, he will find dysentery, often, or generally, called diarrhœa, one of the prevailing ailments, and, perhaps, cholera; together with headaches, periodical or irregular rheumatism of the face or head as it is called, toothach, sciatica, with tic douloureux, or other varieties of neuralgia, bilious affections, as the phrase is, and a whole catalogue of all the nervous ailments which, at different periods, under different fashions, have been attributed to various causes; to the nerves, the spleen, the stomach, the liver, and now, as is a far more convenient phraseology, to the chylopoietic viscera.

Even if all these should be absent, or if from fortitude, carelessness, poverty, or from weariness or contempt of physic, persons who are thus habitual and hopeless sufferers, should not give a physician all the opportunities of minute observations which he might desire, he will be a bad observer if he does not discover in the sallow complexions, the languor, the irritable tempers, or the melancholy character of individuals thus unfortunately situated, that they are suffering under fixed derangements of the larger glandular viscera; often of the liver, and perhaps much more frequently of the spleen. And should he have those opportunities of examination which severe diseases of this nature afford, he will be enabled to convince himself that this very species of disease, the noted produce of the places that notoriously generate Malaria in the hotter climates, is also habitual to the similar situations in our own country, if under a less severe character; and that it is one of the leading causes of that undefinable ill health peculiar to the situation of the patient, as it is, apparently, the great cause of so many distressing, nervous, and dyspeptic symptoms.

the nature of a test, if such a term may be used, by which the power of any given place in producing Malaria may be determined. Hereafter, chemistry, striding on as it does with such unexampled rapidity, may, perhaps, put us into possession of a test of its own, by which we may be enabled to determine its presence as easily as we now do that of oxygen or carbonic acid. Till then, we must be content with what we can command; and the test here alluded to is human susceptibility.

It is notorious, that those who have suffered severely and repeatedly from intermittent, or, sometimes, from remittent, become, and even through a long course of years, so highly susceptible, that the slightest exciting cause, and, among others, the slightest application of Malaria, is capable of reproducing the disease. That this is true of the host of sufferers at Walcheren, needs not be said; while it has been also found common among those who have suffered from the intermittents of China or of Canada; as indeed of many other countries, among which Moldavia is said to be pre-eminent. Hence, therefore, where we find that such a person has experienced a renewal of his disorder, from communication with a place otherwise suspicious from its nature, it offers as convincing a proof as can be desired, that there Malaria is produced or producible.

It is true that there may be, and there in fact are, places, where, apparently from the small quantity or moderate intensity of the poison, persons in health, to whom these diseases have been unknown, may not suffer at all; while this negative is often used as an argument in favour of their salubrity. But it is a negative which proves nothing, if the effect can be produced upon any one individual; while it must be remembered that it is a very injudicious argument to repose on, when it is known, that in certain seasons, places which are but moderately unhealthy become extremely dangerous; and there is never any security that where the poison exists at all, it may not at some day be called into complete action. Let it be remembered, also, that accessary causes, causes that will be enumerated hereafter, must often concur, and that many persons are unsusceptible of the poison, as some are of small pox and other diseases; facts which, it is easy to see, will have an additional influence when the Malaria is not existent in great abundance, or when its virulence is inferior to that which it displays in the hotter climates.

The whole condition, in fact, of a people so situated, as I have now sketched it, is precisely that of the inhabitants of the pestiferous districts of France, Italy, and elsewhere; since in these, and independently of the noted epidemics, or the occasional severe or marked fevers, the population is, perennially, and even through life, subject to a whole catalogue of chronic ailments; the only difference being, that in our own far less unwholesome districts of a similar character, these are less violent, and, also, commonly less perennial and less durable.

Such are the evidences, derived from the production of absolute disease, whence it is here judged that particular situations, often little suspected, are productive of Malaria; because that poison, where its generation can be demonstrated in the production of the acknowledged diseases of which it is the cause, produces all these obscurer diseases also, and because these situations do actually contain the same elements which constitute marshes or soils generative of this poison; the difference consisting in nothing but slender modifications of form or distribution, or variations of dimension.

But it must be added, also, as an unanswerable argument, "that these very spots are known to produce the common intermittent; and thus, while they demonstrate their powers in generating Malaria, even to those who know of no test but this common one, they also aid in proving that all the concatenated diseases just enumerated depend on the same cause, occurring, as they do, in the same persons, often the sequel of intermittent or of remittent, and notoriously common in the situations in question, while rare in others. Unquestionably, the marked and regular intermittent is by no means necessary, nor, perhaps, even common, in these places; but the force of the argument derived from it will not be injured by their exception. We are not bound to explain this, until we can also explain why intermittent is not always produced where remittent is generated, why certain countries abounding in the remittents of autumn do not produce the intermittent of spring, while the reverse is also not uncommon; or why the rice fields of Bengal, if that be true, are not as poisonous as those of Lombardy. This is the misfortune of our ignorance at present; and it is a difficulty that will not be solved till we become acquainted with the immediate nature of Malaria, or at least with the immediate chemical actions under which it is produced.

It remains to mention one more fact, and in

There is a pride indeed in foolhardiness, but it is a sufficiently silly one; while there are abundant useful or necessary hazards which every one may encounter, if he pleases, and which many must brave, however unwilling. There is little merit in courage where there is neither duty nor utility; but if some, as is but too true, cannot quit the places where their lot has been cast, nor entirely avoid the hazards to which their modes of life may subject them, there is still much to be done in avoidance and precaution, which will be discovered hereafter, in the course of this essay; while it is satisfactory to reflect that our sufferings were at least the inevitable result of our duties, and that we have not aggravated them by our own want of prudence or want of knowledge.

I am almost ashamed, on this subject, to answer such an argument as the following; and yet it is by such arguments that the people at large do defend their opinions; while I must not forget of what the mass of mankind is composed, nor who my readers may be. A resident in a Lincolnshire fen dies of a remittent fever at the age of thirty or forty. The cause cannot be in the pestiferous spot, it is said, else the man should have died at twenty, fifteen, or ten. The answer does not seem very remote, and needs not be very long. At Mantua, at Ferrara, at Syracuse, at Cagliari, no one should live at all; every man should die at the hour of his birth. I need not be more explanatory; let others complete the answer.

If I have now dwelt at some length on the evidences from which I shall shortly enumerate certain little suspected situations as generative of Malaria, it is because I consider the assignment of these as a matter of the greatest importance, inasmuch as the health of the people must very mainly be affected by their knowledge or ignorance in this respect. It is by knowledge and conviction of what is insalubrious that they will avoid ill health and death, as far as inevitable duties or circumstances permit; as it is by ignorance that they will run themselves into dangers and sufferings which they might have avoided.

And it is only thus, also, that those remedies which consist in altering the nature of poisonous situations can be applied, applicable as we know them to be. There was a time when our rude ancestors did not know that their poisonous marshes were the causes of pestilence and death. This we have learned, and have profited accordingly. But we have not learned all; though, with the usual conceit that attends on every new step in improvement, we would fain believe that we have nothing more to acquire.

It will be seen, when the classes of soil and situation which I am shortly to point out shall be enumerated, that there are many, very many cases, in which either the remedy, the remedy of prevention, is easy, or where the hazard, always incurred through ignorance, needs not be encountered. But, for these ends, they must be known; and, for these ends, further, the people must be informed, or rather convinced. My duty, as it is my design, is to make them known; let he who has the power of convincing mankind that they have been in error, and that they are ignorant, undertake the other task. But time effects what man cannot; and hereafter, perhaps, an English gentleman will be as much surprised that his neighbour should dig a sleeping canal before his door, as that his feudal ancestor should have built his castle in a marsh, and inclosed it within a putrid moat.

To suggest that he who does this is sowing the seeds of disease, that he may reap the fruit of fevers and apothecaries' bills, is to excite the smile of superciliousness or contempt; as he must long yet submit to be the object of both, who would try to convince mankind that the pond which has been constructed for a few gold fishes, or the river which meanders through the woody valley, is a death-spring of diseases, or that the fevers and the tooth-aches which are the torments of his family, the ailing wife who is his own torment, and the sciatica which is the torment of his poorer neighbours, are the produce of a few bunches of rushes, or of a splendid display of waterlilies. Yet the time is not very long past, it is not every where past yet, when the intermittent itself was supposed to be salutary, when a "spring ague" was esteemed such a blessing as persons of similar powers of reasoning even now esteem the gout; and the time will also arrive, when he who has smiled at this philosophy, will, in his turn, be the object of a smile to the heir who shall expend in laying dry as much as his predecessor wasted in inundating.

The obscure cases in question are very principally such, that while prevention is generally easy, either by amending an existing bad situation, or avoiding an incurable one, it seems especially called for, from their number, as well as from the number and the invetracy of the diseases thus generated. Let me urge what I said before, that Malaria produces,in itself, a far wider mass of human misery than any other cause of disease; as, for the world at large, it is also the cause of far more than half the mortality of mankind. And that many of the diseases which it produces are almost beyond the power of physic, while marked by a resistance which often terminates but with life, is an additional reason for making every exertion to avoid what we know not how to cure. And further, if I am myself fully convinced by wide observation, it would also not be difficult to prove, that this very persistence, the cause of so much misery, is most generally the result, not of a fixed disease, of organic affections, as commonly supposed, or of inveterate habit, but of incautious or unknown, and repeated or continued exposure to the re-exciting cause, Malaria.

Hence, if the diseases from this cause are incurable in the places where they arose, as is notorious in every marked situation of this nature throughout Europe, so it is from repeated exposures to Malaria that they are renewed, even under change of place; and from ignorance, generally, of the situations, too often unsuspected, which are productive of the poison. He who labours under an incurable intermittent in England, is perhaps sent to Italy or France for change of air and a cure; as thousands are daily sent, for other reasons, to the same countries. The physician forgets, and the patient knows not, that he is flying Scylla to rush into Charybdis, and too often confirms the disease or meets the death which he meant to avoid; while he who hopes to leave consumption behind him at Montpellier, leaves it indeed in the grave where the fever has superseded his more tardy enemy; as he who flies from poverty and England to the banks of the Rhone or the Loire, finds too late that he has bartered his health for the expected ease and happiness of France.

And thus, even in England, it is the Malaria, lurking even in a thousand unsuspected places, which perpetuates, if it does not produce, those diseases which are the curse of thousands, rendering life a burden to the owner, and depriving him of those powers for the use of which he was created. If, with these views, the cases which form the subject of the fourth Chapter are, especially enumerated, both minutely and strongly, if even any one instance should prove unfounded, it is much better that we should err by superfluous precaution, and even through groundless fears, than by ignorance and rashness. I am fully willing to bear the blame of exaggeration, if exaggeration shall be proved; or the ridicule, should that be the weapon preferred: holding little of the civil courage of him who, with such an object in view as the benefit of mankind, is not ready to submit to that which has ever been the lot of those who undertake to do good to others, against their will, and in spite of their prejudices or ignorance.

CHAPTER III

On the soils and situations which most commonly produce Malaria.

It is as superfluous to describe what constitutes a marsh, as it is unnecessary to insist on what is universally admitted. But this condition of land is subject to so many diversities of character, and such variations, that it is by no means superfluous to notice some of them, particularly where they are, in the popular opinion, esteemed innoxious; as it is only by cautioning the people respecting these unsuspected evils, that we can succeed in diminishing the production of this class of diseases.

Now, to commence, while it is generally believed that marshes of fresh water are, even in our own island, productive of Malaria, it is a scarcely less common popular conviction, that salt marshes are innocent in this respect. Whatever may be true of the northern and colder parts of Britain, no observer can doubt that Malaria is produced by salt marshes in the southern parts, and, as might be expected, most conspicuously in hot summers; the examples being found in so many places that it is unnecessay to name them, since the difficulty would be to find the exemption.

Could any doubt indeed remain about this, it would be removed by the examination of this kind of soil over almost the whole world. The salt marshes of Normandy, of which the country round Dol may be taken as a sample, are notoriously productive of intermittents, to such a degree, that scarcely an inhabitant is exempt from them; while the general effect on the population is what is usually produced in such cases; a condition which will fall under review hereafter. It is the same on the French shores of the Mediterranean; it is the same in the Adriatic, on both shores, as it is in Greece and Italy generally, and as it is in Sicily, in Sardinia, in the Crimea, in Spain, every where, in short, in the middle and southern parts of Europe; and it is equally true of every part of the African, Asiatic, and Amecan continents, at least within the range of heat, which, however indefineable, extends far beyond the torrid into the temperate zones.

It is perhaps superfluous to add here, what, if not strictly the same, is so far analogous as to admit of being quoted, and of which examples might equally be drawn from many other parts of the world.

It has frequently been remarked in Holland, that the severest seasons of fever have followed casual irruptions of the sea, and also that, on these occasions, there has been produced a degree of putrefaction, attended with an insufferable smell, unusual in other cases; a fact which, if not necessary to the generation of Malaria and fever, still marks an ultimate degree of that vegetable decomposition which, in some previous condition, is capable of producing the peculiar substance which is the cause of the diseases under review. Nor is there any reason why this, and many other similar and analogous facts, should not be true; since we know that the decomposition of dead vegetable matter takes place as effectually and readily in salt water as in fresh. It has even been asserted by many writers on this subject, both in France and Italy, that the putrefaction is more rapid wherever salt and fresh water intermix, and that salt marshes are consequently more pernicious than fresh; the well known experiments of Sir John Pringle on the effects of small quantities of salt in aiding this process, having been quoted in support. Facts, in confirmation of these opinions, are quoted from Leyden in 1679, where an accidental event of this nature produced a very destructive fever; from Martigues in France, and elsewhere; but whatever the value of the theory may be, there seems no reason at least to doubt that other circumstances being the same, it is at least indifferent whether the marsh be salt or fresh.

Further, it is a popular prejudice, and a somewhat more defined one on the same subject, that however such soils may produce Malaria when exposed for any length of time, their injurious qualities are remedied wherever they are washed by the sea. But for this also there seems no ground; however difficult it may be, without an accuracy and extent of personal examination which must ever be impossible, to be satisfied that, in situations of this nature, there is not some portion or spot present, independent of that which is subject to daily inundation from the tide. Others must attempt to investigate the truth here, as far as they can; but, in the mean time, the testimony of all voyagers seems to establish, that there are few places more productive of Malaria and fevers than the palm and mangrove rivers of the tropical climates, as I shall have occasion hereafter to show more particularly; while the characters of these are too well known to require description. Perhaps similar doubts as to the exact purity of the observation may sometimes attach in our own country; yet there are few tracts in England more productive of a Malaria, which is even of a virulent nature, than Heron bay and the river banks in general about Reculver, where the water is salt, and the whole is covered twice in the day. The same indeed is true of so many parts of England, that the enumeration would be equally tedious and superfluous. Be the truth, however, what it may, in this case, it will be always the most safe belief to adopt the opinion and to act on it; as the philosophical evil of the error, if it be one, bears no comparison to its value as a practical security.

The power of woods in generating Malaria is not less notorious than that of marshes, at least in the tropical climates. To repeat all that has been written respecting this particular class of soils, would be to compile without purpose. The jungles and the jungle fevers of India are as familiar, even to the multitude, as the ditches and fevers of Walcheren. The jungle, it must however be remarked, is a low and dense brushwood, or a thicket of reeds and grass; and it is often, consequently, as the residence of moisture and decaying vegetation, analagous to a marsh. Yet the production of fever does not seem limited to this particular species of woods in India; since, according to the testimony of Buchanan, confirmed by that of others in several parts of the East, fevers are produced among the opener and larger forests, in Mysore and elsewhere, and are in fact the usual concomitants of all woods.

Yet in this matter, and even in those climates, there appears some irregularity, as far at least as we can judge from the reports of ordinary travellers; since it is said that, in Cambodia, Cochinchina, and Siam, there are extensive tracts of wood where fevers are unknown. As to Africa, the same rules seem to apply, as far as it is known to us; and the same also seems true of the warmer regions of America, however the opener and drier pine forests may be exempt. I need not here notice the mangrove woods, because they have been mentioned as a variety of salt marshes, and will come under review again for another purpose. But I may be allowed to remark, that what I have quoted respecting the woods of those peninsulas and shores which intervene between Bengal and China, does not appear matter of authority; particularly when the same traveller remarks that, reversely, the plains of these countries are insalubrious, while those of Bengal are healthy; since this assuredly is not the fact. Though it is the remark of an acute general observer, it must be supposed one of those errors of observation not unusual with those who have not been exerting their attention on a particular subject.

Even in the warmer climates of Europe, as well as in the colder ones, very little suspicion seems entertained respecting woods; yet while there is much reason to doubt their exemption from Malaria in our own quarter of the globe, I have no absolute evidence against them to produce, from the writings of physicians and economists, or none at least which is very definitive. It is possible that they may have been overlooked amid districts where there are other causes present in abundance; as it is easy to attribute to the open soil, what may, in reality, be the produce of the wood in its neighbourhood. If there are scattered facts, which seem to prove my conjectures respecting their pernicious properties right, I am unwilling to quote them; since there is so much more of foreign inquiry on this subject, which I must needs leave to a future investigation and to others; intending this, as I do, rather for a stimulus to future inquirers than as an entire inquiry in itself. I have a far other opinion of the extent and importance of this subject, than to suppose it capable of being adequately treated in a sketch so slender as this is meant to be: and if, in the hands of Italian writers, this question, even as it relates to their own country alone, has often occupied three or four volumes, each as bulky as my own, I need not surely say that I have not here exhausted the subject.

There is the more reason for thinking that close and wet woods in general, throughout Europe, at least in the warmer parts, produce Malaria, from the fact of their unquestionably producing it in our own country. If any one will examine the districts in Sussex and Kent which produce both intermittent and remittent fevers, he will often be unable to assign a cause, unless he seeks it in the woods, which, from their characters, seem amply competent to this effect. And we must often explain, in the same manner, the occurrence of these fevers, in the form of habitual endemies, in Hampshire, as well as in Essex: occurring, in the latter, in the center, and on the borders especially, of Epping forest, in the higher grounds, even where the soil is gravelly, and being by no means limited, as is popularly imagined, to its flat wet meadows or marshy tracts. And, in a similar manner, it is found that autumnal fever occurs, even in Wales, and among the grounds of the higher vallies, in the vicinity of plashy woods and coppices, and even where these are situated on the steep declivities of the hills. Let others who have better or other local opportunities, extend these proofs by adequate investigations; since, to any one inquirer, the means of such examination must necessarily be limited.

But there are some general facts belonging to this question which must not be passed over, particularly as, for want of making some necessary distinctions, there will be found, in writers, considerable contradictions on this subject. However I might wish here to examine the whole, it would infringe on the order of this Essay, to notice at present what belongs rather to the propagation than the production of Malaria; and I can only regret that it is nearly impossible to prevent the different branches of this inquiry from interfering with each other.

If woods or trees do, in certain and sufficiently numerous cases, generate Malaria, and thus render a district unhealthy, they are also often a safeguard; or a country which was before healthy, may become the reverse by cutting them down. In such cases, the poison is actually produced sometimes by this change; in others, the propagation merely is facilitated or extended. As a proof of the former fact, Rush has observed, that, in Pensylvania, epidemics invariably follow the clearing and cultivation of forest lands, and that they do not disappear till after many years of continued agriculture. The same remark has been made in France: and the district of Bresse (Lyonnais) which was comparatively healthy when full of woods, has become nearly depopulated since they were cut down. In this particular case, as in some others, the facility of propagation has probably been increased, and may have been the main cause; but in that of America, above cited, and in others, in addition to the mere circumstance of breaking up the land, the cause will be found in the action of the sun on the wet ground, previously guarded from it by the shade of the trees. It is a more general cause, if one which operates more slowly, that thus also the climate is improved, or becomes warmer; a fact of which there is abundant evidence all over the world; and thus, even over a whole country, the production of Malaria may be increased. To this general effect I have alluded in speaking hereafter of Rome; and it is not improbable that it has had a very extensive influence all over Europe, and indeed in America also, however counteracted by improvements of various kinds; since, as is familiar, the whole of our division of the world has undergone an immense change in this respect, or a general augmentation of its temperature, since the times of classic antiquity.

Reversely, it follows that the planting of trees will sometimes check the production of Malaria, by protecting wet lands from the action of the sun: while by absorbing and dissipating the moisture, and not less by destroying, through their shade, an injurious vegetation, they may act in other modes not less salutary. There is a real truth therefore in Pliny's remark, elsewhere quoted, that trees destroy or consume the mephitic vapours; however inaccurate his philosophy may be on this subject.

It is plain, therefore, that even independent of the effects of trees as relates to the propagation of Malaria, a circumstance in itself of great delicacy to understand or manage, it will require considerable attention and reasoning, and those directed to the precise spot in question, to determine on planting or the reverse, when the object is to correct an unhealthy soil by such means;

while nothing more can here be done than to furnish the general principles by which any such attempts must be guided.

To say that rice grounds are productive of Malaria, is equally to state a fact notorious to the whole world; while the causes, consisting in a succession of inundation and drainage, approximate them in character to swamps and marshes, however obscure the immediate operation of either in producing this poison may be. How extensively Italy suffers from this cause, it is quite superfluous to say; since the mortality in Lombardy, and elsewhere, arising from it, is matter of daily observation, even to the most incurious travellers. And the same is true of Greece and Sicily, as it is generally of Europe, wherever this grain is cultivated.

In France, the same remarks have been made, far too extensively and by observers too accurate, to leave it a matter of doubt; it having been further demonstrated, that this cultivation has introduced disease where it was unknown before, and materially augmented that of lands where Malaria had formerly existed in a moderate degree. Here, as in Italy, not only are the usual summer fevers produced, but the inhabitants are, in the same manner, the victims to visceral ob-

obstructions and dropsies, as to all the other ailments elsewhere enumerated. It is even stated, on authorities which seem to admit of no dispute, that in those districts the term of life does not exceed forty, and that the population is decimated in every year. In certain parts of Russia, and pointedly near Oczacow, the cultivation of rice is prohibited for this reason; and it is well known that a similar intention as to certain parts of France and Italy, had seriously been entertained by Napoleon, while some partial attempts were also made to carry it into execution. In spite of such experience and such evidence, there are persons, as in all points of physic there have ever been, who assert that the cultivation of rice is not unwholesome, and that in Italy especially, it is not a source of Malaria. What answer can be made to assertions in the face of all evidence? what but that silence with which we receive the similar assertions of those who maintain that plague and jail fever are not contagious. The reason assigned by Zacchiroli will not at least be received as proof; when it is, that the air in such situations contains as much oxygen as elsewhere. Could Eudiometry prove this, it would prove much more that we should be well pleased to find true; and when he wishes similarly to prove that hemp ponds cannot be pernicious, because the water contains tannin, we can only smile at the all-sufficiency of a schoolboy's chemistry. Unquestionably, it may be admitted that rice grounds will vary in this respect according to the nature of the soil, the mode of treatment, the periods of inundation and drainage, and the peculiarities of the climate, so that it is even possible to conceive a case of exception; but unless China can produce such, I know not that one instance of exemption has yet been pointed out.

A similar assertion has been occasionally made respecting the rice grounds of India, namely, that they do not produce fever, and, consequently, do not generate Malaria; it being further asserted that this is especially the fact in the peninsula. Indian experience, it might be said, should be allowed to determine how far this is really true; as no one ought to contradict such an assertion from theory or analogy. In the mean time, we may at least be allowed to doubt; while if it should prove true, it is but like so many other anomalies in this case, incapable of explanation for want of more accurate knowledge of the necessary facts.

It will be difficult, however, to admit the truth of an opinion which considers the rice grounds of Bengal or similar districts as not productive of remittent fever, until it is explained whence arise those fevers which so often rage in India, and of which the year 1762 produced so destructive an instance; since it was computed that, in this one season, the mortality included 30,000 natives and 800 Europeans in Bengal alone. Inundations of the Ganges may be allowed their full share, and so, in many situations, may jungles; but if we exclude the rice cultivation, we shall scarcely find sufficient causes for a mortality of this nature, of which that country furnishes, and has furnished at all times, abundant examples.

But were it even admitted that such a cultivation, in that country, did not produce fevers, or rather, what is the more common assertion, that it does not produce intermittents, and therefore does not generate Malaria, it does not follow that it does not generate Malaria productive of other diseases. Malaria does not necessarily produce intermittent; as the pure and simple, original ague is rare in many of the most pestiferous parts of Europe; yet no one doubts its existence in those countries. And that it produces glandular and visceral affections in France, in Sicily, in

Italy, all over Europe, without previous decided fever, or without producing fevers at all, is as notorious as any thing in the whole history of these diseases; while there seems no reason whatever to doubt that this is also a common occurrence in our own country. Hence, therefore, it might even be admitted, were it necessary, that from some unexplained peculiarity in the Malaria of India, or of the climate, or of the state of constitution in the individuals, its action was often to generate glandular disease rather than pure fever, since the common endemic of India, hepatitis, is in reality the produce of its Malaria, and probably of that of its very marshes, meadows, and rice grounds. But it really seems unnecessary to seek for explanations to answer what appears the mere random assertion of a few individuals, biassed by some hypothesis, or unacquainted with the subject.

Such is an enumeration, as far as it is here necessary, of the most obvious and acknowledged species of soils or situations productive of Malaria. This is the ordinary view of the subject which is taken by the people at large, wherever obvious circumstances have led them to feel an interest in it; and I have, therefore, for the greater part, thought it superfluous to be minute, because that would have been to detail and to prove what is known and admitted. If there are other kinds of land which, as modifications of these, must also be ranked among the admitted sources, they are so much more nearly connected with those cases where the production of Malaria is doubted or denied, that it seems most convenient to pause here, and to class all the remaining causes together in one chapter. And I hold it the more useful to adopt such a division, because these remaining cases will thus attract more attention than if they had been confounded with the broader facts from which they essentially derive, and because my chief object in this history of Malaria is to call the public attention to the innumerable neglected or denied sources of that poison.

CHAPTER IV.

Of the soils and situations less conspicuously productive of Malaria, or as yet unsuspected of it.

To begin with the qualities of soil or situation which are least likely to undergo dispute as to their power in producing Malaria, or which are partially or tacitly acknowledged to possess this property, I may commence from the fundamental point, the marsh or swamp.

If it is acknowledged or proved that marsh or swamp, whether fresh or salt, is generative of Malaria, it is also a very common opinion that a certain extent of this soil, and, generally, a considerable one, is necessary to the production of disease. This is an error; and it must be classed among the dangerous ones, as being productive of a false security.

A priori, if a large tract of land in this particular condition produces a given quantity of Malaria, it is certain that this mass must be an union of all the portions generated by its parts; and if, as is the fact, however vaguely stated, this poison is the chemical produce of vegetables living or dead, acting on water, or acted on by it, then must every plant and fragment of a plant contribute its share of the deleterious substance.

Now there is a certain analogy between Malaria and the matter of contagion, but on which it is unnecessary here to enter: and while we know that a quantity of contagion which is imponderable, as it is insensible to every chemical test, and equally so to all our senses, is sufficient to produce its peculiar disease by its poisonous and chemical action on the body, we have no reason to suppose that effects analogous may not be produced by the minutest portions of Malaria; since, if we suppose any imaginable quantity applied, however large, it is still as insensible and as imponderable as the matters of contagion. It would bear that analogy in this point, which it does to contagion in so many others, if a small quantity were as efficacious a poison as a large one; and there are reasons for supposing, practically, that this is the fact, since it is matter of observation, that a minute's exposure to Malaria, a single inspiration probably, and of a poison which must be far more diluted than contagions can ever be in the same circumstances, is sufficient to excite its fever, and, very notoriously, in [illegible], or in those who are subject to that morbid sensibility derived from former or habitual fevers. And as a moderately careful observer can confirm this last fact, it may be concluded with as much security as such a case admits, that the quantity of Malaria necessary to produce its peculiar disease or diseases, is undefinably small, and probably extremely minute.

Could this admit of doubt, or should those who have made no observations, or who are incapable of observing, choose to deny the well-known facts now adduced as evidence, it would be proved by the great distance to which Malaria travels through the air without losing its poisonous quality. Not to dwell here on examples which must be adduced hereafter, it is quite familiar that from any known and often very limited spot, this poison will proceed through the air, or on the winds, to distances of three or four miles, exciting as much virulence as in its native marsh. This, to quote a familiar domestic example out of hundreds that might be adduced, occurs on the hills of Kent, far from the marshes of Erith, Northfleet, or Gravesend; and it is easy to see that whatever was the body or quantity of Malaria in the original place of its production, or whatever portion of atmosphere it occupied over the few acres by which it was produced, it must often, in such a course, have been diluted to a degree so incomprehensible, that while we can only wonder how it should exist at all as a distinct substance, or a chemical compound, even more must we be surprised that it should be capable of producing its peculiar diseases, with an activity as great, and often greater, than it did at the very point of its birthplace.

In reality, this implies an activity on the part of Malaria, or, what is the same thing, a power possessed by minute quantities of this poison, to which that of all the contagions with which we are acquainted bears not the most remote comparison; since it is notorious that the distance of but a few feet from the most active sources of these poisons, of the contagion of plague and of typhus, for example, is sufficient to render them innoxious, even where the presence of a crowd of living bodies in the act of producing them, assures us that the quantity generated must be considerable, and when we have also reason to believe, from the facility with which they unite to solid bodies so as to retain their properties, even for years, that they are not destroyed in the cases referred to, but merely diluted into inactivity.

The conclusion is obvious; and there is nothing in it which seems to admit of dispute, since it is almost a question of arithmetic. If the produce of a hundred square feet, or acres, or of any scale and number of parts, can, under a dilution of one thousand or ten thousand times, excite disease, then must, in the inverse ratio, the produce of the one-thousandth or the ten-thousandth portion of that space be capable, before dilution, of producing the same effects; or a single blade of grass acting on water (if this be the cause) may be as efficacious as an acre; supposing, of course, that it is actually applied to that part of the body which can suffer from its action.

A marsh, therefore, as far as its essence* consists in producing Malaria, is not to be defined by space, or it does not demand extent; and I must now show that it is not to be defined by its aspect, as that is commonly understood. It is essentially necessary to analyze this subject to its very ultimate elements, before we can form a right understanding respecting it.

In different climates, a marsh or swamp, other circumstances being the same, may vary materially in its obvious aspect, according to the nature of the plants which form its vegetation; but as no well founded suspicion has ever yet been entertained that these have, according to their diverse qualities, any influence in this matter, we must at present, perhaps, consider them as mere vegetables, living or dead; since we cannot prove that there is even a difference in the action of the ligneous and the herbaceous plants, other than what may depend on the relative facility of their decomposition.

I do not, however, mean to prejudge this particular question, or to suppose that the nature of the plants subjected to the action which produces Malaria, does not affect either its virulence, or its quantity, or the rapidity of its production; or even, further, that as there are diversities of contagion producing different diseases, so there may not be differences in the varieties of Malaria, whether depending on this or any other cause, which influence or direct the production of the several disorders which arise from this as a leading or generic source. So far from that, we might, in the first place, very naturally infer, that as certain parts of any vegetable are more prone than others to decomposition or putrefaction, and as there are also some plants which run faster into this state than others, so there might be important differences in the quantity, quality, or rapidity of the poisonous produce, connected as this is with the decomposition in question.

Thus, also, knowing, as we do, that the sensible gaseous produce of some plants in this state, is very different from that of others, and knowing also, from chemical analysis, that there are numerous and very striking differences in the elementary constitutions of plants, as there are in their actions on the animal body while in a living state, it would not be an irrational supposition that the peculiar substance, Malaria, which results, as a genus, from all vegetable decomposition, could be regulated, as to certain variations, by the original chemical nature of the plant producing it; or that, under this leading type, there were essential varieties, poisons capable of producing different diseases or modifications of disease, just as different gases, distinguishable by their smells, if not as yet subjected to better and chemical tests, are produced during the decomposition of such plants.

Thus, to have recourse to illustration, might the cruciform plants, or the tribe of fungi, produce a Malaria differing from that poison as resulting from the gramineous ones, or the consequence of the putrefaction of seeds differ from that of leaves; and thus also, while the putrefaction of capsicum produces a gas singularly fetid and remarkable, as does that of the Bixa Orellana one not less offensive, if different, might the Malaria generated by these be attended with unusual virulence, or some other peculiarities. If it is true that we have not as yet any decided evidence on this subject, there are not absolutely wanting some facts which appear to justify such a conjecture; such as the peculiarly poisonous effects of flax and hemp in this state; together with those of indigo, often observed, and those of coffee and other substances, as supposed to have been ascertained at New York.

Thus also has it been thought or said, that one cause of the superior virulence of Malaria within the tropics, consisted in the great proportion of astringent barks or vegetables which those regions produce; though the reason assigned, namely, that they contain animal matter united to tannin, will scarcely be taken in lieu of evidence. If some French writers have been at the trouble of drawing up a sort of Flora of their own marshes with such a view, it would be sufficiently easy to imitate them as to our own or any other country: but when they lay great stress on the influence of narcotic vegetables, with not a little leaning also to a fancifully threatening physiognomy in the plants of such soils, it ought to be remembered that there is no great proportion of the aquatic plants which is narcotic, and that as far as beauty is concerned, there is nothing very unpromising in the Nymphœas, the Butomus, the Hottonia, the Hydrocharis, the Sagittaria, the Ranunculus aquatilis, nor even in the Arundo, the Typha, the Scirpus, and many more, which form the predominant vegetation of the most poisonous ditches and marshes. But, to pass over what is fanciful, the subject is at least one of curiosity and interest; nor only thus, since it might even become of value in the question of prevention: but while nothing but possibilities can yet be suggested, we must trust to future observation for the investigation of this, among many other questions still involved in the darkness which besets almost the whole of this important subject.

But to pass from this; the essential character of all marshes and swamps, as far we yet can decide, is, that the land should be partially inundated, that it should be dry in some places and wet in others, or that pools and dry spots should be intermixed, or that it should be boggy and soft from the mixtures of earths and decayed vegetables with water, or that it should be subject to peculiar alternations of moisture and dryness, sometimes amounting to absolute inundation in the first case.

Now, in all this we see no apparent reason why the water of the marsh should produce Malaria, because we do not find that water produces it in other situations; and as little have we reason to suppose it the produce of earth and water mixed, or of clay or mud; since neither is it caused by such mixture where vegetation, or vegetable matter is not present. Nor is it produced by the mixture of decomposed and subcarbonized vegetable matter and water; since it is notoriously not produced by dead peaty bogs, or by peat which carries no vegetation. The presence of vegetables or vegetable matter, therefore, in some mode or form, is necessary; while the conclusion has sometimes been, that it is a production formed between the living vegetable and water; more generally, that it is generated between that and the latter in some stage intermediate between life and absolute decomposition; or, lastly, that it is the consequence of absolute putrefaction.

A qualifying remark is, however, here necessary on the subject of peat. This is a substance which is not generated at all, above a certain average temperature, on account of the rapidity with which, in the higher ones, vegetable matters hasten to utter decomposition. Hence it is limited, either to the colder climates or to the more elevated regions in the hotter ones; and though not by any means confined to a temperature so low as to be incapable of producing Malaria, the greater and more numerous tracts of peat land will be found to belong to countries or places where the production of this poison is checked for want of the necessary heat. With this limitation, there will be no difficulty in showing, as I shall very soon, that peat lands are not exempt from the production of Malaria; though as no gas appears to be generated from this substance under the action of water, when once it is thoroughly formed, no such produce could be expected from perfect peat; while we must look for it in those cases where the process is still incomplete, and chiefly in those where the vegetation is still going on, or where the whole series is in action, from the living vegetable to that completed peat where all decomposition seems at an end. With respect to the other remark, namely, that the presence of living vegetables is necessary, or that Malaria is not formed during the putrefaction of that which is absolutely dead, or disintegrated, it will shortly appear that this is an erroneous conclusion when too exclusively made, though it may be viewed as a sort of rule; yet under exceptions in particular climates, that is, in the colder ones, which almost render it useless, and even false, as a rule of practice, or as a rule connected with precaution.

Recurring now to the case of marshes, it remains therefore first to inquire, whether this peculiar contact between a living vegetable, or a vegetable in a state of incipient, or further decomposition, and water, does not take place in many situations that are not marshes, either in the popular, or in any sense; and if this can be shewn, there is one main datum obtained; while, if the former be also granted, namely, that space or bulk is not necessary to the generation of Malaria capable of producing disease, we have all that is necessary to prove, *a priori*, that a thousand places, hitherto unsuspected, are capable of exciting the disorders of this great class; while the proofs, *a posteriori*, will be found in the evidences enumerated in the preceding chapter, or may, for each place so inferred, be discovered by such examination into its local diseases. As to the case of absolute putrefaction, or of decomposition, united to disintegration, I shall reserve the inquiries to a separate chapter; seeing that it comprises some facts and statements which have been subjects of doubt or dispute.

Now, that this peculiar state of vegetation not only as to the appearance and character of the soil, but as to the mode of growth and death, and the very nature of the plants themselves, does occur in numerous situations that are not marshes, is the point to be proved, and is a point indeed that will require no proof to almost the most superficial observers; no proof assuredly to botanists, whatever it may to medical men; not often even to the observant inhabitant of the country, whatever it may to the limited man of towns and cities. If the botanist will recognize the spots in question by the nature of the plants which attach themselves to such soils, if the growth of an Iris, an Equisetum, a Hydrocotyle, points out to him what the farmer sees, though less acutely, in tufts of rushes, or traces by the coarseness of the pasture or the canker of a tree, it is the latter who will know every spot of land about him which asks for drainage, where he to whom these pursuits are strange, will seek in vain, even should he, as a physician, be engaged in investigating this very question in a medical view. So necessary is even such knowledge in a science scarcely to be cultivated, and an art no to be practised effectually, without a range of study far greater than is dreamt of by the mass of mankind, or than is often imagined even by physicians themselves. To such observers I must trust, to confirm facts that cannot be transported to the tables of the sceptical or ignorant; and I may now proceed to specify the chief varieties of place or form in which these circumstances occur, and thus to shew, under what obscure, questioned, or unsuspected circumstances, Malaria, with its consequent fevers and diseases, occur.

I have just observed that pure peaty bogs do not produce Malaria; and the same opinion is entertained in Scotland as to all peat mosses, in whatever condition; while the popular reason is sought, since causes must always be found, in the imaginary antiseptic qualities of peat, or peat water. As a general statement, it is as far from being true, as the reason is fanciful and false. Peat possesses no antiseptic qualities: it cannot itself putrify, because that process has in reality been completed, if in a peculiar manner: it is, thus far, what a vulgar phraseology in science used to term a *caput mortuum*. The water of peat possesses no antiseptic powers; its contents, minute at all times, are merely a hydrocarbonaceous compound, somewhat resembling bistre or resin. The opinion is as puerile as the language is unmeaning and confused. The climate of the great peat bogs of the north of our island is one that has not energy enough to produce Malaria, from any thing, except in very peculiar seasons; while it is so far from being proved that the intermittents of the fenny and peaty counties of England are not actually generated in the very soil which is supposed to be so adverse to them, that there can be no question respecting their power in this respect, and as little respecting the great extent and severity of the diseases produced by these very lands. Further than this, I cannot confirm, by any very decided fact, the power of a pure peaty bog in producing Malaria in our own country, nor can it possibly be necessary: while I have little doubt that observers possessed of means that I have not, will find no difficulty in establishing, by marked and decided facts, that, under a sufficient heat, they are, among us, as active in this evil as any other wet vegetating soils: and that they are so in Holland, no one will question, whatever difficulty there may sometimes be in separating and discriminating the actual causes, in those cases where land of this nature is intersected by drains or ditches.

It is also a popular opinion, that the rushy pools and petty swamps so common in high moorlands, are innocent, or incapable of producing Malaria. I know not why they should be more exempt than other marshy places, unless under a very high elevation or a cold climate; and that the fact is not so, has been proved to my satisfaction, most convincingly, by many cases of the occurrence of intermittents, even in Wales, and at considerable elevations, in those very situations, and from these unquestionable causes; while one instance is so remarkable as to be worth quoting specifically, though I shall rarely indulge in a species of proof which must depend, as being a single fact, on the veracity of the narrator. In this instance, a considerable body of labourers were employed in excavating a pond on a moor of this nature, situated about a thousand feet above the level of the sea; and in the course of the work, within a very short time, nearly one half were incapacitated by the ague. And if such rushy spots can, because they are extensive, produce an extensive effect of this kind, so, as will be more fully confirmed hereafter in parallel cases, there is always cause for suspicion in the vicinity of even the smallest fragments of such wet land, be the character what it may.

There can be no doubt either, that the minute marshy or swampy spots which occur occasionally in a thousand low situations, whether on commons, near woods, by road sides, or in innumerable other places where they scarcely or never attract notice, are similarly productive of Malaria and disease; though their limited range of action generally renders their power in this manner insensible, unless when houses happen to be erected in their vicinity. Their characters as to vegetation are precisely the same as that of larger spots; while it would be abundantly easy to quote examples of bad health, and even of severe fevers, produced by them; though difficult and tedious to refer to the exact places, obscure as they are innumerable, or to convince the incredulous of the truth of the fact. As to the smaller spots of wood, or coppice, or brushwoods, as yet little suspected in England, even where extensive, I need not recur to a subject on which I have said all that was necessary in a former chapter; since in this case, as in that of marshy grounds, the possibility of a poisonous produce is not dependent on the extent: though, were it possible to refer to the places, or could the enumeration which has convinced myself, produce any greater conviction than the general fact thus stated as operating on my own, it would be easy enough to enumerate the specific examples on which this general assertion is founded.

In how far meadows which cannot be called marshy are capable of producing Malaria, is an intricate and entangled question; partly on account of the difficulty of exactly limiting the term meadow, or defining the degree of moisture, and partly because they are so often intersected by drains and ditches, which may sometimes be the generative sources, instead of the including land itself. I cannot hope to clear this question by an exact definition; but taking the term in its usual lax sense, it appears unquestionable that there are many tracts of meadow, or of alluvial land, not marshy, and often not intersected by ditches, at least in a conspicuous manner, which are the sources of Malaria all over Europe.

Such is the case with the alluvial tracts at the entrances, and sometimes also at the exits of the lakes of Switzerland, and, doubtless, elsewhere; and such is the case all over France, in the alluvial lands that border the great rivers, such as the Loire, the Seine, and the Rhone; and in places innumerable where there is no proper marsh, nor even an approach to such a character, to which the prevalent diseases can be attributed. Such also appears to be very frequently the fact in the interior of Italy; though I will not pretend to speak decidedly on any case which I have not personally examined; knowing well, that neither ordinary travellers, nor even medical observers in general, deserve much reliance on these subjects, inasmuch as they have not yet seen the necessity of pursuing these observations with the necessary accuracy.

I think, however, that the testimony of Volney on this point is most satisfactory evidence to the purpose; because, while his general accuracy as an observer is well known, and while, as not being a physician or a theorist on this subject, he must be judged unprejudiced, he appears to have bestowed a minute attention on it during his travels in America. And that testimony is, that every valley in the country which he visited, does produce the fevers of Malaria; while, as he has minutely classed his causes, so as to enumerate woods as well as marshes, and, besides all the other better known sources, distinguishes even rivers, universally, and, still more minutely, mill-ponds, there can be little doubt that in thus enumerating valleys, he has done so as exclusive of such specified sources, and therefore that, in these, he must have had an eye to the meadows alone by which they are characterized. The same conclusion must be drawn from many of the pernicious tracts which occur on the shores of the Mediterranean. Here, and in every country within this boundary, there is perhaps no valley terminating in the sea, be it in Spain, Italy, Sicily, Greece, which is not a seat of Malaria; while, though many of the rivers which they include produce salt or fresh marshes, there are also many where no proper marsh is formed, and where therefore the poison must be generated by the meadow lands; by tracts which are also the seats of an active cultivation.

But, indeed, with respect to meadow lands, there is a circumstance of considerable importance to be considered, and which, in fact, suffices to determine this question; while if, in some cases, it rather belongs to another branch of causes, it is too indeterminate and graduating in its degrees, to be omitted in this place; since I am persuaded that it will be found the very common cause of the Malaria and disease produced by the lands of this class. In the extreme cases, it *is* inundation and subsequent drying, falling therefore to be considered again elsewhere; in others, it is that drying during spring and summer, which follows the moist or wet condition of such meadow lands, as they are left by the winter rains. Instances of this, in all its degrees, abound every where: but as one established example is enough, I may point out the lands about Fontainebleau at the junction of the Yonne and the Seine, notorious for the "Fievre du pays;" so injurious, that few escape fever or intermittent over a considerable tract, while it is a pure example, inasmuch as there is nothing else present; nothing but that drying of moist meadows, whether previously inundated or otherwise wetted in winter, which takes place under the summer heats. How extensively this cause operates as to meadow lands in all cases, be their characters what they may, I need not add: and I may therefore safely conclude, that wherever the heat of the climate is sufficient, such tracts will be among the most common causes of disease.

But whatever particular causes may exist in any specific case, the mere fact that such tracts of meadow are productive of Malaria, is sufficient to operate as a caution respecting them, whether in the choice of habitations, or in occasional residence during the seasons in which that poison is called into action.

To what extent and in what places, similar land produces Malaria in England, will best be judged of by those whose local opportunities give them the means of ascertaining where the diseases arising from this cause exist. But that this fact does occur, and frequently, admits of no doubt; while I should find no difficulty here, as in every other case which I have described, in proving it most extensively, by details, details of disease and enumeration of places, derived from personal observation or unquestionable authority: that authority also being peculiarly valuable, as being, in almost every case, a mere report of the occurrence or prevalence of autumnal fevers in certain places, while the cause was unsuspected. But it is evident that such a proceeding would double the bulk of a volume, which it is most desirable to keep within moderate bounds. A very few notices only of this nature are admissible.

If some of the great tracts of meadow land in this country have once been marshes, and have been recovered to their present condition by drainage, it is very certain that there are many of them which are now purely meadows, without the least remains of the marshy character; while some are even as dry as the ordinary lower lands of the plains and vallies. And yet, that these do produce the diseases of Malaria, is familiar to every one's experience; though, in enumerating some of the instances, I cannot pretend to say that the cause may not, sometimes, lie rather in the ditches than in the meadow itself.

This is true of the meadows which border the Thames, not only beneath London and through their whole extent, but above it; which, though often retaining the name of marshes, because once marshy, are now as dry as the common meadow lands of inland vallies and plains. It appears to be the fact also in many parts of Cambridgeshire and Essex, and, among others, in the vicinity of Waltham Abbey; as it also is in Kent in the isle of Thanet, in Somersetshire, in Lancashire, in Huntingdonshire, and far more commonly indeed than it is necessary or convenient to enumerate. Thus it also was, even in the Carse of Gowrie in Scotland, until that great tract of alluvial meadow was brought into universal cultivation; and this may perhaps serve to prove that the meadow land itself, and not the ditches, was the cause, because the latter remain, while the grass has been succeeded by almost universal crops of grain. And it will be found, in confirmation of this, in France and in Flanders, and probably far wider than I now know, that where tracts bordering the same river, or in any other respect exactly similar, whether in soil or situation, are, respectively, cultivated with grain or kept in grass, there the production of fever or of Malaria is correspondent; occupying the uncultivated lands so as to produce what is popularly called the *fievre du pays*, as if it was a necessary part of the order of things, and flying from those that have been ploughed for a grain cultivation.

How the two facts, relatively, that is, a grain cultivation or pasture, act in this case, it ought to be almost superfluous to say; since the former husbandry will be commonly adopted whenever the meadow can be maintained in such a state of drainage as to fit it for the plough, while a condemnation to pasture is also, in itself, almost evidence of wet land. But I must here also add, what I am obliged to remark elsewhere, that the mere act of ploughing, with the crops and processes which follow it, produce a very different effect as to the natural moisture of the soil, from that which must occur under a dense covering of luxuriant grass.

If, in these instances, I have chiefly had in view the flat meadow lands on alluvial soils, which, whether they have ever been marshes or not, generally occupy the bottoms of vallies and the margins of rivers, the same is not less true of upland meadows, and even of perpetual pastures on the declivities of hills; of all meadow or pasture land, be its situation what it may, which is retentive of moisture, or which the winter leaves poachy and soft in spring, as it is thus rendered so again by the first autumnal rains. If I could confirm this by specific facts, it would be even more inconvenient, from the difficulty of reference to such spots; and I shall, therefore, content myself with suggesting to those who, in the country, wheresoever, observe the fevers of autumn to occur or prevail, to examine the land around, and to see whether, in the absence of more obvious causes, this one is not present. They may thus convince themselves as I could not so readily convince them; since they may be assured, as I hope to prove satisfactorily hereafter, that some such cause is always the cause of these fevers, and that all the others so often resorted to, are imaginary; while it is also fully time for them to understand that such fevers are not contagious; are not typhus. To proceed to other causes.

It is not only a popular but a rooted opinion in England, that there can be no Malaria produced near a running river or stream of any nature; an error, beyond doubt, and one, of which the consequences may be, and are occasionally, serious.

With respect to the rapid streams of mountainous or elevated countries, it is not probable that they are ever the causes of such diseases; yet, in France, this opinion is held respecting all the rivers at least that intersect the flatter lands. In a work so popular and, in this sense, vulgar, as the Letters of Madame Campan, this opinion is expressed in very strong language. And it is apparently the result of a wide experience in France, though there are doubtless cases where the inclosing meadow may be the cause of what is attributed to the river banks. As to America, we have the very strong and decisive testimony of Volney, the accuracy of whose observations can seldom be questioned, that every river in that country which he visited, whether rapid or stagnant, produces Malaria and fevers. How frequently the same opinion prevails in Italy, cannot fail to be known to the numerous travellers in that country.

That the same should occur in tide rivers, such as the Thames, would be a natural expectation, from the margin which is thus exposed under all the worst circumstances that belong to marshy lands. And that it is the fact with regard to the Thames, I formerly noticed; always providing a saving clause against cavils from the vicinity of ditches or undrained spots, as already remarked. And if the same effect should occur in any river subject to alternations of altitude from floods, or from ordinary increase and decrease, as is remarkably the case with the Loire, it cannot be a matter of surprise, because the deserted margin, or the bank which is alternately wetted and dried is, in many cases, precisely a marsh, in as far as we can conjecture what are the circumstances in this which do produce Malaria. Where, under such circumstances as this, the exposure of mud is the consequence, it forms a case which will come under examination hereafter.

If indeed any argument were wanted farther, to prove that the perpetual flow of fresh water, or the alternate rise and fall of the tide so as to cover twice in the day a tract of the nature in question, were not remedies or preventives against the production of Malaria, it is amply demonstrated, and in a thousand places, in the intertropical or hot climates, as I formerly suggested when speaking of salt marshes. One or other of these is the condition of those rivers, the character of which will be understood by all who know the nature of such regions, when I call them Mangrove rivers, let the woody vegetation or jungle consist of what it may: and similar tracts of mangrove, or of other jungle or thicket, occur almost every where in those countries, which, if they do not give passage to a river, are perpetually washed by the clear green sea. Yet no one needs be told, that of all pestiferous soils or tracts, none exceed these in destructiveness; the Malaria being never absent from the margins of such a river, even when steadily full, and appearing at the ebb tide, in the other kind of situations, almost at the very moment the ground emerges from the water; a fact amply and bitterly ascertained in our naval service, everywhere.

Whatever doubts may still exist as to rivers in general in our own country, in this case, there is no reason whatever to doubt that such streams as the Ouse, the Lee, and all others flowing with similar difficulty through fertile meadows and with a flat vegetable margin, are productive of Malaria, because the diseases which attend it are common in all those situations. And, *a priori*, we ought to form this conclusion, because the margins of such streams in particular, are in every sense marshes. And abundant facts, falling under my own observation, have shown that such diseases as I have formerly adduced in proof of Malaria, exist habitually and endemically on the borders of similar streams, of even the smallest size; on those, for example, which flow almost like artificial canals, through shaven lawns that border them with a thin and grassy margin. Here indeed, in England, popular opinion decides that no such disease can be generated where water flows, even should it flow through a pond; but it is one of the cases where popular opinion is popular ignorance or prejudice; as it is sufficient for any careful observer to investigate such streams and the state of the inhabitants near them, in any part of England where they exist, to be convinced that the fact is as I have here stated it. That any one should study to introduce such ornaments into his grounds where they do not already exist, or select them as places for the formation of pleasure grounds and the sites of houses, is one of those pernicious errors which it is a part of the object of this essay to remove.

If, in this case, and also in others, I have often comparatively neglected foreign countries, and entirely omitted the tropical and distant climates, to dwell on our own, it is partly because this essay is intended chiefly for our own countrymen, partly because, with respect to other countries, the information to be procured is not sufficiently accurate; and also because, as to the tropical climates, I can add nothing from personal observation, and could only repeat what is already known to those who have attended to this subject, or may be found in books, if with some difficulty, and in the form of casual remarks, by those who are desirous of studying it.

A canal, partaking partly of the nature of a sluggish river and partly of that of a stagnant pool, should naturally be esteemed a probable source of Malaria; because its margin possesses, or may posses, all the essential qualities of a marsh, as a diminution of its waters may expose mud impregnated with vegetable matter. This, in fact, is the point which we must always have in view; it is the analysis of the whole question. If it is not putrifying mud, it is the marshy spot, the peculiar vegetation, or death of vegetation, carried on at a certain point of vacillation between earth and water, which is the generative cause; and while this may exist in a hundred different characters of ground or situation, and while further it is not essential that bulk or space should be present, it is easy to see that the business of investigation is, in reality, reduced to a very simple principle; for those at least who are gifted with the powers of observation and generalization. Let this fact be ascertained by a due examination of any spot, and the probability, at least, of Malaria is established: let it further be ascertained that certain diseases do belong to those situations, taking care also to prove that they are endemic or local, and the fact of its production is determined. That such confined spots do not act far beyond their immediate limits, that they do not produce the same wide effects of disease as extensive marshy tracts, does not prove that they are not seats of Malaria. That which is originally but small in quantity, may, by being transported even to a short distance, be diluted to nothing, or to absolute inactivity; while further, in all such cases, it will depend on many collateral circumstances whether the poison which they produce shall extend to any marked or notable distance, or not. This is the common and constant error, whence the pernicious nature of such confined spots, be their characters what they may, is overlooked, or denied. We are not to expect that a pool of a few square yards is to cause fevers throughout a whole country, while also it may be so situated as never, or rarely, to be approached. But if it can affect its immediate neighbours, or excite but one fever in the course of years, the fact is as fully proved as it is of the Pontine marshes.

To recur to the facts in absolute evidence respecting the noxious powers of canals, it is sufficient to revert to Holland, respecting which I know not that there is any dispute. The canals of Batavia, in a far worse climate, are still more notorious. As to the few canals of Italy and France, lying as they so often do in districts of which the atmosphere is almost an entire mass of Malaria, it must, in those cases, be fruitless to inquire what share their banks or bulwarks possess in its production. The facts, as far as they are known to me, are not pure enough to ground an evidence on from observation, and we must be content with the general reasoning *a priori*. If however the canals of France shall be held authority for England, or even for Europe in general, we have the authority of Monfalcon for their pernicious nature; since he enumerates them, generally, all through France, as sources of Malaria; not apparently deeming it necessary to adduce such special evidence as I have been obliged to seek for, since not encountering the same incredulity.

In our own country, if I have not, personally, been able to produce absolute evidence of the existence of the appropriate endemics in the vicinity of canals, I attribute it solely to want of means for sufficient personal observation. I have little doubt that the fact will be found such; but must be content to point out to others who may have opportunities, an inquiry into this part of the subject.

Next to canals, I may rank ditches and drains, already noticed as probable causes of the production of Malaria; and since they possess every property of a marsh, and in the very worst form, it seems unnecessary to dwell long on a cause so obvious. What limitations may be required to this as a general rule, are also too obvious to require more than the barest notice; as we can have no reason to expect Malaria in the comparatively clean ditches of upland grounds, where neither the drain itself nor its vegetation possesses the marshy character.

But if facts should be required respecting the pernicious effects of ditches or drains, Walcheren itself seems to furnish unexceptionable evidence; since the soil itself is sandy, being a mixture of clay and sand: and it appears to be from the drains chiefly, a few pools being also present, that its most pestiferous air is produced. That, in the Campagna of Rome, which is also a dry soil, the Malaria seems similarly to be produced by the drains, is a remark which I shall have occasion to make in another place. I know not indeed why there should be any reason to question the fact at large, nor, unless from decided proofs of innoxiousness, to deny it of any particular case; since the chemical condition of a drain is so often that of a marsh. It is only for those to doubt this, and much more which I have here attempted to prove, who are guided by words, and to whom the connection between the two sounds, marsh and ague, is exclusive as it is all-sufficient: unable to generalize the cause, as unaccustomed to view any thing in its principles. Or, otherwise, these statements are disputed by those persons who conceive that an injury is inflicted on them by endeavours to enlighten them; incapable of pardoning even him who would confer on them a benefit, when, before receiving that, a tacit confession of previous ignorance is necessary. It is the man who persists in eating the wrong end of his asparagus.

Yet further, where medical men doubt or deny in these cases, entraining with them, very naturally, the general mass, it often arises from that inveterate error which I cannot point out too often, so essential is it that it should be remedied; namely, the perpetual seeking after ague as the sole proof of Malaria, and the as perpetual forgetting, or not perceiving, that the fevers of summer, which they persist in calling typhus, are the produce of the very circumstances in question. Should it be doubted that such is the general feeling among our own physicians, as among the people, I could prove it, as far at least as a single authority, on both sides, of the highest character, can prove any thing, by adducing the two greatest names in our own country, each in his respective department, in proof of this. A sense of propriety, of which no one will question the necessity, prevents me from naming those personages, as I must, for the same reasons, suppress even the name of the place in question. All that I can venture to say is, that after a demonstration of the most palpable nature, it was merely admitted that the fetid mud thrown out in clearing this spot might indeed be unhealthy, and should be "corrected by quicklime," but that *quoad* marsh or stagnant water, there was no hazard, and that the fevers generated every autumn in its vicinity were not its produce, but common typhus.

While on the subject of drains, I must now also inquire respecting the drains of towns or houses, in which, whether open or close, there is no living vegetation; a subject of some obscurity, and on which there is a great deficiency of absolute evidence. There is, I need not say, a general impression, I might perhaps safely add, a general experience, of their insalubrity; in proof of which I might refer to the municipal reports and reforms of towns and cities beyond enumeration, as I might, very especially, refer to the history of the improvements of our own capital, and the correspondent increase of its health. The question is, whether these receptacles produce Malaria and the diseases arising from it, or whether that which they have been esteemed to produce is typhus, or disease of an analogous character. There is abundance of general statements which would indicate that the former is the fact, but there are also, as might be expected, not wanting many which would show the reverse; a natural enough consequence of the universal and long continued carelessness in distinguishing between marsh fever and contagious fever. I find one however which is decisive, and which seems to me quite sufficient in itself to establish the former opinion, or to prove that the diseases thus produced are the diseases of Malaria. This is, that in the Salpetriere at Paris, intermittents were common among the residents confined there, and that the Malaria having been suspected to enter the house from the drains, the disease was, at once and for ever, removed by making alterations in them.

Nor, on general principles, is there any reason to doubt that this must be true, while it offers the readiest explanation of the experienced insalubrity of such receptacles. A large proportion of the contents must always consist of vegetable matter; and it is shown elsewhere, that hemp, flax, indigo, coffee, and so forth, in a state of putrefaction or something analogous, do produce Malaria, independently of any vegetation. And that the fevers resulting from drains do occur in summer and autumn, or at those seasons when Malaria is generated from all its other foci, seems to present a further confirmation of their nature and causes, since typhus, it is well known, is limited to no season, and is indeed, in many towns, most frequent in winter.

Such appears to me the conclusion to be drawn as to this subject. I do not always expect to convince others by the facts that have convinced myself; but that must not prevent me from adding, that in a house well known to me, where intermittent fever was perpetually brought on in an occasional visitor of considerable susceptibility, as it had been, on former occasions, in another person of the same constitution, and during a long course of years no cause could be assigned but the passage of a sewer beneath the house, or the existence of a well, since both were suspected; and that in another similar case, the recurrence of an intermittent, long cured, seemed as decidedly to have been caused by the casual inundation of a cellar. Should the absence of vegetation be here held an objection, the fact that it can be produced by the exposure of damp and naked ground, is put out of doubt by a fact related by a physician and an author, whose name has escaped me, occurring in the West Indies; where, on the removal of some stores which had for some time covered a piece of ground, and on exposing it to the light, an immediate and severe fever among the workmen was the consequence.

But before quitting this particular class of stagnant waters, I must notice one case which seems important as illustrating the general principle, as it indeed is with a view to sanitary measures, although the exact circumstance has almost ceased to exist in England, or occurs now but in a few places. The castle of Flamandville, near Guellette, in Normandy, is situated on the high lands where no endemics of this class are known; but, being surrounded by a moat, has, for generations, been noted for the bad health and destruction of its inhabitants; while it may be partly accidental as connected with this, that the original family has at length been entirely exterminated, undergoing, as is well remembered in the neighbourhood, that gradual diminution of powers, both of mind and body, which is so conspicuous in the Orleannais, and in every part of France, in fact, where Malaria is perpetual.

It is not unlikely that, to similar causes, we must often attribute the mortality of the besieged in the castles of the feudal times, knowing, as we do, that fevers and dysenteries were the causes of all this loss of life. Medical men indeed, often, or generally, attribute this to want of provisions, water, and so forth; and, as constantly, have considered these fevers as the contagious typhus, or the fever produced by confined human effluvia.

This error, which I can never omit to notice when opportunity offers, that of mistaking remittent fever for typhus, an error so universal that we trace it through almost every medical work, and so common, even to this hour, as to be committed every day by nine-tenths of practitioners, or more, is one which, while it confuses the whole history of endemic, as well as of epidemic fevers, has also produced a train of incalculable evils, in the cure, with even far deeper and wider ones in the business of prevention. If medical history is full of glaring examples of this in our own day, so it is from similarly false views that we must now read with distrust, almost all that is recorded of the diseases of armies in ancient times, and very much of what belongs to modern warfare under the same head. Hence, we cannot fail to suspect that the mortality to which I am here alluding, arose from the causes that I have stated, assisted, as is invariably the case, by the various collateral evils which attended both the besiegers and the besieged, though we cannot very properly dispute without facts more particular. But while it is not very obvious why typhus should be generated out of the habits of a baronial castle, where every defender was almost for ever in the air, it is abundantly easy to understand how remittent and dysentery might arise from confinement within a ditch, aided perhaps by scanty food. This is very nearly the recent case of the Penitentiary, so long and so improperly the subject of controversy; a case in which not the slightest doubt ought for a moment to have existed, either with respect to the cause or the disease, and where a remedy was sought by letting in that Malaria, which it should have been the object to exclude, or else destroy, as far as possible, after an admission that could not be prevented.

And further, this view is confirmed by the analogous consequences occurring to the besieged, and very frequently also to the besiegers, in the case of modern fortifications. There is often the same bad or scanty food, with similar fatigue and exposure in the night as well as in the day; while the works to be defended are either surrounded by water, or, if the ditch be not wet, it is seldom truly dry in those flat countries which are the most frequent seats of fortified towns. And, in fact, even in peace, these fortified places are very generally unhealthy, and productive of the diseases of Malaria, as will be discovered on inquiry by any who will be at the trouble of making it; while it is scarcely less easy to ascertain, that, in most of these cases, the focus of the disease is in the ditch, and that the attack, or the fever, falls first on the sentries who mount the night guards on the ravelins or the glacis. This was notorious in Malta during our first occupation of the works of Valetta, whatever the fact may be at present; though, in that particular case, as I shall hereafter attempt to explain, it is not certain that the ditch actually produced the

Malaria which occupied it, and which affected the guards of those particular posts so remarkably. But almost every fortification in Flanders and Holland, and many in France, will afford evidence enough of this nature; as will Portsmouth also, in our own country, if I am not very much mistaken, even at present, though much improved of late by means which I need not here detail.

To mention but two facts more, one of which particularly proves the insalubrity of such works, it had been suspected that the fevers at Bourg en Bresse, which, down to the middle of the last century, had so tormented the inhabitants that half of them were incapacitated for a third of the year, arose from the ditches of its fortifications. These were consequently filled up, with the result of effecting an entire change, in the disappearance of those fevers. Lastly, it had been observed that at Havre de Grace, the soldiers were seized with headach and giddiness within five minutes after approaching the ditch, with the usual consequences of fever, and that fever, of course, of a violent character. Whether this fortification has been reformed or not, I am ignorant, but it is a case strongly in point; while it also serves to prove, incidentally, that a very brief exposure to this poison is sufficient to produce the effects, and further, that the effect immediately follows the application.

The last class of situations requiring notice, includes all still or stagnant waters, from the largest lake to the smallest pond; and it will be found to comprise an immense number of localities in our own country, respecting which also there is perhaps less popular suspicion than with regard to any other species of ground generative of Malaria.

A lake cannot, it may be thought, be otherwise noxious in this sense, than as it may contain marshy margins, or be skirted by the wet alluvial tracts, formerly noticed, and generally found at the entrances of its streams; and I need not therefore dwell minutely on that particular subject.

But it requires observation to detect a thing even so obvious as this ought to be. The general purity of the waters of a lake, added to its brilliancy, often to its romantic or picturesque character, and not a little aided by poetical feelings or metaphysical prejudices, commonly remove all suspicion of this nature; and, after the physician interested in investigating this subject, it is perhaps the painter, or the geologist alone, who will discover, or even see, along the shores of such a piece of water, the particular ground which is a cause of suspicion or a source of disease. Whatever, with other views, these latter may detect, it is not the splendour of the scenery, the limpid purity of the waters, nor even the rocky precipices or pebbled shores, that will be, to the former, a warranty of health and security, if he finds these limpid waters encroaching occasionally on a meadow, or the gravelly margin shallowed by accumulating reeds and water plants, or the water lily reposing in some creek, undisturbed by the waves. Here, he will see reasons for suspicion, even in the most romantic lakes of an alpine region; and should they lie in a warm climate, his suspicions will be too commonly justified.

And they will also be confirmed by a great mass of facts derived from the Lakes of Switzerland and Italy; there being abundant records even of severe epidemics in these countries and in such situations; independently of the ordinary endemics, and of a permanent bad state of health in the inhabitants, which can scarcely fail to be known, even to general travellers in those countries, of any observation. How the fact stands in our own country in this particular case, I am unable to say; while, though such effects might possibly be found in Westmoreland and Cumberland, they could scarcely be expected in Scotland, where our chief lakes lie, on account of the low temperature of the climate.

When a lake lies in a flat country, a case of which our own Whittlesea mere offers an example, it is much more easy to understand how it should be a source of Malaria, without further explanation; since not merely its margins, but much of the surrounding land, must possess those qualities which are pernicious. Such is the natural history of a large portion of Hungary, noted for its insalubrity, and such also is that of many considerable tracts in France, often referred to in this essay on account of their highly pestiferous nature; the waters in question, of different sizes, amounting often to many hundreds within a small space, and including therefore what must be called pools, while they form the basis of a very profitable inland fishery, regularly farmed and cultivated. Respecting these, I must add, that they are there esteemed fully as poisonous as marshes; a fact inferred from comparing two unhealthy and extensive districts of these different characters.

But it must also be said in explanation, (a view which is important, as it concerns all waters of this nature, even to pools,) that in France, it is supposed that the Malaria is not solely produced by the vegetating marsh, but is disengaged from the mud which the summer leaves dry, (a fact which I must notice again) and that it also escapes from the bottom and through the water, accompanying the air which is so notedly extricated in those cases. And in confirmation of this, it is said, that while such pools retain a considerable depth of water, or whenever their banks are steep, no Malaria is produced, but that it appears in the reverse cases, or, either on the diminution of the water in depth, or on its retiring from the shores. The same facts, I should observe, have often also been noticed in the West Indies; while a very strong case, illustrating this particular cause, is stated by Senac, in France, where, in a town previously unaffected by fevers, a violent epidemic was produced, in consequence of an unusual evaporation which exposed a large portion of the bottom of a lake. From these facts it is an obvious inference, that in warm climates, at least, whatever may be the case in our own, tranquil or stagnant water is unsafe in any form, and that a vegetating margin is not rigidly necessary to its pernicious qualities; though it cannot be doubted that the evil is materially diminished by cutting off this additional source of Malaria.

With respect to other still or stagnant waters, including mill-dams on all scales, from some hundred acres to a few square yards, and comprising also fish-ponds, artificial and ornamental lakes and canals, together with casual pools formed in uneven ground, or, as near London, in old gravel pits, there seems, independently of their sizes, but one marked difference among them; and that is, whether they do or do not transmit a running stream, and in what quantity as it relates to the renovation of the mass of water which they include. In mill-dams, this is a fundamental property, though the renovation varies in almost every instance. It is generally the case also with ornamental waters and fish-ponds, but seldom or never happens with the remainder of the pools classed under this head.

Now here, as in the case of rivers, it is a popular conviction that there can be no "danger," as it is expressed, when there is a running stream, or a renovation of the water; an error of the greatest importance, as I shall shortly demonstrate. If, among the general mass, this is a mere opinion of rote, the usual ground of belief with the vulgar, there are not wanting among others, reasons, such as they are, for this piece of philosophy. All the danger apprehended is invariably from stagnant, absolutely stagnant and putrescent water; or it is considered that either the smell is the criterion of the hazard, or that the poison and the smell are one thing. Thus, a water covered with duckweed, or crowded with potomogetons, nymphæas, and other floating and absolutely aquatic plants, is the exclusive object of terror; while no fear or suspicion is ever entertained respecting a limpid and apparently pure water, whether at rest in a green lawn, or gliding quietly along its grassy and poachy margin.

If I once thought that a heresy so wicked and an alarm so absurd as I have experienced the contrary belief to be, was my own exclusively, it was for want of reading; and I am now most glad to find myself supported by Monfalcon, though how far he also may be accused of belonging to the class of terrorists, I cannot pretend to foresee. "Pieces d'eau d'agrément;" "lacs artificiels," such are conspicuously in his catalogue of evils; and with such aid I may therefore boldly continue to defend my own opinions, while I would gladly not have been able to produce the proofs which, even now, I shall leave to be conjectured. If he refers pointedly to the artificial water of Chantilly, as the source of frequent and serious epidemics, so does another authority, D'Audebert, ascribe some peculiarly severe intermittents occurring in his experience, to a similar piece of water, and a similar cause. On the subject of such ornamental pieces of water, however small, I could not indeed wish for stronger testimony than that which respects what s called the " canal" at Versailles, almost a mere fish-pond; and which, like the similar "piece d'agrément" at Chantilly, is noted for producing summer fevers and intermittents; so noted as to have been quoted by Monfalcon as a special example of the pestiferous nature of such spots; while I have seen the very effect produced, and instantaneously, on an English visitor to that " Tibur" of the antient monarchy, and that effect being as inveterate a tertian as I ever witnessed.

We have not enough of pure experience yet, to decide whether water, in all cases, emitting smell simply from decaying plants immersed in it, or water confined by walls or clean earthen banks, and producing purely aquatic or floating plants, does produce Malaria, independently of the exposure of its mud, or of a diminution which allows the air to escape from the bottom.

It would, however, be very surprising were such water innoxious; since it ought to be indifferent whether the vegetable decomposition is produced under this peculiar mode, or in the plants while attached to the land. It would not therefore be safe to conclude, that by walling in the water of a pond, and thus destroying the vegetating margin, we have ensured safety, though we have excluded one source of the poison; and hence I should not consider this alteration in the canal of St. James's park a complete remedy, although my own proposal; since it is notorious for the abundant produce of aquatic plants, causing, in autumn, an even insufferable stench. All I can say is, that if in its present condition, abounding in both causes of Malaria, it does not generate fevers, it is the only exception in the whole world, at least wherever the climate equals that of England; a fact undoubtedly which ought to be a source of great self-congratulation. Whether the pond in St, James's square also, forming so refreshing a receptacle for its statue, claims the same English exemption or not, must be decided by Monfalcon; as I am not courageous enough to think that such an Italian substance as Malaria can exist in the center of the English capital. But to finish with this particular question, we do know, from ample experience, that Malaria occurs in abundance when there is no smell and no putrescence, and that the process of vegetable putrefaction, in the ordinary sense of that term, is not necessary to its production. There is good reason therefore why we should shun the vicinity of putrescent and vegetating waters, but there is infinite hazard in rendering this doctrine and this terror exclusive.

To prove that mill-dams, though transmitting large streams, ought to be injurious, from the frequently marshy nature of their margins, would be to repeat what has been said before, respecting the *priori* proofs on this subject in general; and by the same laws we may judge of the other kinds of still water included under this head. To prove it by facts, to prove the actual production of Malaria, in some place or other, and even in a vast number of places, by every kind of pool or still water here mentioned, would be abundantly easy to myself, and will be scarcely less so to any one who will inquire respecting the endemic diseases of those who reside in such vicinities. I might here easily fill some pages with local instances; but I shall be content with naming a very few; selecting such as are either known to others as well as myself, or that may easily be verified by any one still inclined to doubt. That similar condemnation has been passed universally on mill-ponds or dams in America, by Volney, may perhaps assist in satisfying those to whom the authority of a strong name is necessary, or who receive with faith from a stranger and a foreign country, what they are unwilling to believe from him who prophesies where he is known.

About the iron district of Glamorganshire, there are numerous large mill-dams constructed for the supply of machinery, and there is not one of these, in the lower grounds, which is not notoriously attended by the endemic ill-health of all the immediate residents and visitants, consisting in the diseases already mentioned; of which, in consequence of some peculiarities which I do not pretend to explain, the Neuralgia of the face is extremely common. And as the surrounding country is high and hilly, and singularly healthy, as are the people in general, from their state of industry and opulence, these local exceptions are the more conspicuous; being indeed so remarkable as to have attracted the attention of the people themselves to the causes. And when I point out the pernicious nature of such receptacles of water, so very little suspected in our own country, and least of all likely to be suspected, even by medical men, when in a cold or elevated district, I may, from the report of an intelligent medical friend, name, specifically, the village of Hirwain, in this county, where, about four years ago, one-sixth of the inhabitants were affected by intermittent at the same time, and from this very cause.

These are waters on a large scale, and from the size of their streams, rapidly renovated; offering a sufficient proof that such renovation is of no value. In truth, there is no reason why it should be so; since were this as rapid as possible, the pond would even then be but a river, and it has been shewn that rivers so circumstanced are common sources of Malaria and disease. A mill-dam at Southend, near Lewisham, affords another example of a similar nature, on a small scale, and within the reach of easy verification; while it is also an instance applicable to fish-ponds and other kinds of still water similarly circumstanced. Here, the poorer inhabitants in particular, are notedly subject to intermittent as well as autumnal fever, while they bear marks of glandular visceral affections, and are reported to die of the consequences of those disorders. To have seen the fit of intermittent invariably produced in a susceptible individual by an approach to this pond, hundreds of times, and always within a stated distance of time from the approximation, completes an evidence which cannot be controverted.

And if my chief reason for pointing out this otherwise insignificant spot, is the facility of examination which it offers to the inhabitants of London, it will be useful to notice here the whole valley of the Ravensburn, with the communicating low lands, including the villages of Lee and Lewisham, as affording examples, within reach, of the greater number of the less obvious class of situations producing Malaria, which I have been attempting to describe. The use of such examples is, that as there is a peculiar physiognomy, if it may so be called, attached to all such places, the power of distinguishing that is more easily acquired by a single example than by pages of description.

I may add here another instance, from the mill dam of a paper mill in Hertfordshire; after the formation of which, the workmen became subject in a most serious degree, to remittent fevers, which were, before that, unknown; and as the ground in this particular instance resembled that of an ornamental park, as did the water itself, it may suffice to prove what I have advanced on that or canals in these and similar situations, in many of the ornamental grounds and gardens of rural habitations, particularly in the flatter tracts of England, is a fact which has at length been confirmed to me by many individuals who had at first rejected the suggestion: such persons now recollecting what had not originally struck them, that their families were always unhealthy, and, in particular, that their servants were so, while residing at their country houses, though free from such complaints in their town residences. And when, during the last summer in particular, it has been notorious, that not only numerous individuals, but entire families have experienced fever under change of temporary residence, sometimes in their own country houses, at others in the several watering places situated amid the circumstances here pointed out as suspicious, there seems nothing wanting to produce conviction; since most assuredly these fevers were not the contagious typhus.

On the subject of the smallest, and the least suspected, perhaps, of all kinds of ponds, I shall commence by quoting one instance, because it was notorious to the medical establishment of Woolwich in those days, and because there are, doubtless, officers and surgeons both, alive still to confirm it. This was a pond occupying an old gravel pit on the common, close to a house belonging to the late Dr. Hutton, and occupied by General Stehelin; its whole extent being but a few square yards. It was remarked, for a long course of years, that the inhabitants of this house suffered under perpetual agues; and it was not until this pond was destroyed by the alteration of that common, that the disease disappeared, and for ever.

This is perhaps sufficient proof as to this class of stagnant waters; but, if I mistake not, it will be found that the occurrence of ague and fever together with other ill health, in numerous places where the gravel pits of commons are filled with water, is the consequence of this very cause, and that in reality, these situations about London, and elsewhere also, so often selected on account of the imagined wholesomeness of their gravelly soils, are very general, and not less unsuspected, causes of ill health: of those obscure and teazing disorders already mentioned which are known by this vague term, and further, of positive fevers and intermittents. And it was not only from reflecting on that case at Woolwich common, but on other analogous ones, that I originally gave the opinion, that provided the vicinity is sufficiently near, and other conditions favourable, there is no spot of water, or, what is the fact, of marshy vegetation, so small, as not to be capable of producing Malaria and disease. I have shown already, that in cases of distant transportation, the poison must be highly diluted, and, therefore also, must be applied in a very small quantity; and on every chemical, even arithmetical, principle, it must be indifferent whether that small portion which acts, is part of a large mass, or is, itself, the whole. If it be a grain weight, or a cubic inch, out of ten thousand, which is applied, or if there be but one grain or one inch generated, and the whole is called into action, the effects must be the same, chemically; while this is a chemical operation, and the last case is the case in question.

To the inhabitants of London, I might easily point out numerous places, even in their own vicinity, offering illustrations of these several causes of Malaria, and more; as it would be abundantly easy also to indicate them in all the southern and flatter counties; while an inquirer can always satisfy himself as to the facts, by simply inquiring among medical men, respecting, in particular, their autumnal practice. To the same readers, and for the same purpose, an easy verification, I might, but for obvious reasons, have quoted a well known house, peculiarly situated in the neighbourhood of London, as having been a most noted focus of ague to almost every one of its inhabitants during a long course of years. And I intended to quote it as an instance of Malaria produced by some small ponds with a grassy margin, used for watering cattle; were there not some imperfection in this case, arising from its position as to the meadows of the Thames; though I am still inclined to seek the cause in these ponds, as the corresponding and neighbouring houses in the same vicinity, and with the same aspect, do not suffer in the same manner.

I must here add a remark on the production of Malaria, which, if not rigidly belonging to the present enumeration, could not well have found a place any where else, while it is too important to be omitted. If the occurrence has chiefly been noticed in other countries, there is not wanting evidence respecting it in our own; while the more generally the fact is known, the more will it probably be confirmed: as happens in every case of this nature, where, until the exact cause of such a disease is pointed out, it continues to be viewed as one of the inexplicable and necessary accidents of life, or is perhaps attributed to some false or imaginary cause.

This fact is, that fevers, and therefore it must be presumed Malaria, are often produced, and frequently in great severity, when pasture lands are for the first time broken up for cultivation. The evidence as to this, is as abundant as it is unquestionable. Volney points it out as almost invariable in America; and so does Rush, as I have noticed, particularly where woods have also been cleared. In the West Indies, very generally, it has long been known that this is a most dangerous operation, since it is the almost universal experience of two centuries; and Cassan describes it as sometimes producing fevers that resemble an absolute plague; the labourers even dying on the spot if they attempt to remain at night on the ground which they have broken up in the day.

Why this should be the fact, if it cannot be very precisely explained, is not at least more difficult than most of what else belongs to this subject; since there is a quantity of vegetable matter killed, and therefore submitted to decomposition; and it would be well worth the trouble of those whose local situations give them the means, to inquire whether this, and many other analogous agricultural processes, now little suspected, are not the causes of the fevers which sometimes appear in rural situations in such an inexplicable manner, when these cannot be better accounted for by stagnant waters of various kinds, or by such neglected spots as I have here been pointing out. The remark is of value, be the solution what it may; because the remedy will be found in breaking up such lands in June, or in May, if the summer be the necessary period, or, what is preferable, in the middle of winter; since the decomposition will then take place at a time in which experience has shown that Malaria is scarcely generated in our own country, nor indeed, generally, in Europe. In the case of lands recently recovered by drainage, this precaution is peculiarly deserving of attention, because in this case the danger is greatest; and the same is equally true of woods, the mere felling of which sometimes disengages or produces Malaria, as is a much more certain consequence where, as in America, and as I have elsewhere noticed, these woods are broken up for cultivation.

On the question of drainage, there are also some remarkable facts, which though nothing very definite can as yet be offered on the subject, from want of sufficient observations, I must also notice here, not very well knowing in what other place in this essay they could be introduced. The bare fact, as stated in the simplest manner, is, that lands subjected to drainage, and apparently laid dry, sometimes even for the very purpose of subduing or exterminating Malaria, have become even more noxious than before; or that even where no previous diseases had existed in the vicinity of such land, they had appeared after it had been drained for the purposes of agriculture. Among other remarkable instances, this appears to have been true, at different periods, of the Campagna of Rome, as far as the facts can be ascertained by comparing the different accounts of Italian writers; while, in speaking of that spot, I have been obliged to notice this circumstance, as it relates to the comparative condition of Rome in the times of antiquity and in the present day. But among some more pointed facts of this nature which admit of no dispute, such was the effect of draining the marsh of the Chartreuse near Bordeaux. A succession of bad fevers, before unknown, commenced immediately upon the drainage, showing themselves first in that part of the town which lay nearest to the land reformed, and lasting through many years; proving so severe in 1805, that twelve thousand people were affected, out of whom three thousand died in five months.

To explain why this should happen, in any particular case, would require a precise knowledge of the individual circumstances belonging to each spot where it is said to have occurred; as it is probable that many of the cases would require distinct solutions. At present, and in this general view, I can only suggest a few of the probable causes; while those who may have opportunities may possibly, not only be able to apply them, but also discover others which, from want of experience, I am unable even to conjecture.

It is not difficult to understand that a swamp in which the water is so deep as to impede the growth of as many plants as a drier surface would carry, will produce proportionally less of the poison in question; and that a similar diminution or under proportion of Malaria will attend such a tract of land if it should contain many pools or spots divested of all vegetation. In such a case, we can conceive a certain state of drainage, such as to increase the vegetating surface, without being at the same time complete enough to check the production of Malaria; or a small quantity of poisonous marsh might thus become a large surface of wet and noxious meadow land.

Thus also, it is not difficult to imagine how the drainage of a lake attended by a noxious margin, might increase the extent of such a description of soil, though the water itself were diminished or exterminated, and a considerable tract of dry land gained also to cultivation.

It is a much more delicate and difficult question, whether there is not also a certain state of moisture, much inferior to absolute wetness, which is more favourable to that peculiar vegetable decomposition whence Malaria is generated; but while some facts seem to show that this is true, there is nothing sufficiently decisive to prove, what also we have not at present the means of rendering as probable as might be wished, from not knowing enough of the process itself, and of the nature of this poisonous matter. When it is asserted that land absolutely dry does generate Malaria, as has been said of many places, it is necessary, before we can admit this, to be very certain that, in these instances, it is not transported from some other place; or that, in such dry land, there are not ditches and drains left from the operations by which it has been laid thus dry. In reality, as I have already remarked, it is from these poisonous repositories of a vegetation equally active in growth and in decomposition, that the Malaria of drained meadow lands seems to be very often produced; while, if there are any other causes, they must be left for future inquiry.

Yet there is a tolerably obvious one, though how far it may have been applicable to any of the known cases I cannot conjecture; and this is, the exposure of the mud of pools, or of that bottom which was, before that, to whatever limited extent, and however dispersedly, covered by water; since this, as I shall soon show more fully than I have yet done, is an ascertained cause of Malaria. In such a case indeed, the evil might be expected to be transitory, and to be limited perhaps to one season; though it is not difficult also to see, that as such spots must be the most depressed parts of the recovered land, they might easily, in successive winters, retain water, so as, again, on the recurrence of the summer heats, to undergo the same pernicious condition. If also, in such cases of drainage, the cultivation of any portions should follow, it becomes evidently an example under the rule already discussed; according to which, lands newly broken up generate the poison in question.

I shall now terminate these details, which I have nevertheless abbreviated, perhaps injuriously, by the omission of innumerable local facts and proofs, and of much that I might have included respecting foreign countries. Such minuteness would however find a better place in a work on the geography of Malaria; a work than which there cannot be a much greater desideratum at present in physic. Whatever detail I have already indulged in, I cannot consider it greater than the importance of the subject demanded; because it is only by rendering the public aware of the causes of their diseases, that they can be taught to eradicate, by activity, and on principle, that which will otherwise only yield, as it has already done to so great an extent, before the slow progress of general intelligence and improvement, or else to avoid, as far as possible, the causes of disease, where the soil itself is incurable or difficult of cure. But the value of such precautions, like that of the present opinions, will not be appreciated till other views than the present ones are taken, of the causes of the common fevers of summer and autumn, or till physicians, if that shall ever happen, coincide with myself in believing that the most frequent, perhaps the general, sources of these among ourselves, and especially in the country, are the soils and situations which I have here described or noticed. It will indeed be a previously necessary step, to distinguish between such fevers and contagious ones, or between typhus and the fevers of Malaria; a distinction, however, which if as yet spreading but slowly in the public medical mind, if indeed even that can be said, must at length become understood, when it will be acted on as mechanically as much else has been in physic after labouring under the same difficulties; since it is not through reasoning, but from imitation, that knowledge is here spread, while in establishing a new opinion or fact, chance or fortune must also coincide with the labour of the original propounder.

If I have already noticed the general ill health and the various disorders exclusive of mere intermittents, which are the produce of these neglected or unsuspected places, it will be of much more general importance if it shall be established, as seems to myself the fact, that all our common summer fevers are the produce of unsuspected Malaria, and not, as is generally supposed, of mere heat, or, when occurring in autumn, of some mystical and unknown influence of the preceding summer, or, as is a common opinion, somewhat better founded, of the effect of this on the biliary system merely. And if, in the country, where it is much easier to purify the evidence, and after many years of watchfulness, in various districts and places, it has proved to my experience that such fevers prevail or predominate wherever there are those obscure causes of Malaria which I have pointed out, (supposing that more decided and acknowledged ones are absent,) and that they can almost always, with care, be traced to some such causes, while they scarcely if ever occur in places absolutely free from such suspicion, I cannot help thinking that it is a fact which will be confirmed by the observations of others, when the same attention shall be turned to the subject. To ascertain the exact truth will be valuable; because it will be a great step in the prevention of evil that may at least be diminished, if not removed.

It is a philosophical evil in the mean time, and will probably long prove an obstacle to the inquiry after truth in this case, that physicians have established so many doubtful or fanciful causes of fever; to discover or imagine any one of which is held sufficient, even any those who inquire into causes, to satisfy the observer and supersede all further questions. And if among such causes, there are real ones, it is also too often forgotten that these are auxiliary or predisposing ones, not essential; leading to errors even more difficult to correct. In other departments, philosophy would act more cautiously and more precisely: in some points, even physic proceeds more philosophically. Malaria is a proved, demonstrated cause of one class of fever, as contagion is of another; and if in the latter case, we labour to discover the insidious or obscure roads by which it has been communicated, so should it be our object, equally, to seek for Malaria where-ever it may lie hid, and not to rest content with those vague and fanciful, or doubtful causes of the fevers of this nature which are commonly received: and for little other apparent reason than because our ponds and ditches do not, like the marshes of Italy or the woods of Africa, destroy their tens of thousands, or perhaps because of indolence and habit, superadded to ignorance and want of reasoning.

If I have insinuated that there are tracts of country, places, in our own island, where fevers, that is to say, the fever under review, in any of its forms, is unknown or nearly so, and if the same is true of many districts in various parts of the continent, even in countries where other tracts are notorious for such diseases, it would not be so difficult as it would be tedious, to point out, even now, the very places, to a considerable extent; while it would be found that these were dry and elevated lands under a perfect natural drainage, or similar moorland or corn districts, or peculiar situations near the sea, of the same character, or districts uniting a particular distribution of the surface to a peculiar nature of subsoil, or general stratification, or rock; well known to the geologists of our island, as well as to agriculturists, for their singular freedom from water, and the reasons for which can often be explained by the former.

And if, as is the fact, such tracts are exposed to the same heats and the same vicissitudes of temperature as those in which these fevers occur or prevail, if the people are the same, and their occupations and modes of life similar, and if the only difference be, as is the fact, the presence of water in some manner, and often very trivial in quantity and extent, while as little noticed or suspected as it is thus trivial, then have we reason to conclude, or at least to conjecture with a high degree of plausibility, that this, the only difference, is the cause of disease which we are in search of; while that is confirmed by every circumstance relating to the production of Malaria which has already passed under review. If it would be tedious to point out the tracts of land to which I am here alluding, it will also perhaps be much better to leave the inquiry to others, each for that division of country best known to himself; while, with these hints, such an investigation will not only be easy, but will produce to the investigator, a conviction which could not be effected by any detail founded on my own observations.

And if, on the great scale, or in the extreme cases, such as in Holland, (where, to such records as that of Walcheren, or of Sluys, in which, according to Lind, the Scotch regiment quartered there buried its whole number in three years, hundreds of similar examples might be added,) the average of life is proved, by the tables of insurance and survivorship, as I shall hereafter show, to be low to an appalling degree, it will not less, if less conspicuously, be found in our own island, that this average is exceedingly unequal, and that, in every case where the fact has yet been examined, it is precisely in the dry situations which I have been describing that it is highest, while, reversely, it become gradually lower as water, in almost any form, is present: almost emulating Holland, and in a very obvious gradation, as we come down to that state of the soil where Malaria and its diseases are no longer a question of dispute. That our own tables have not yet been corrected, as justice demands, by such considerations, is no proof that the fact is not as I have here stated it; as the carelessness with which this subject has been hitherto treated, is well known to those who have attended to political arithmetic; while some recent attempts at greater accuracy, proving also, as they do, the increased public longevity, give hopes that the whole of the subject will, ere long, undergo that review which is so imperiously called for.

If I feel while I write, what I have for so many years experienced in personal discussion, that it is difficult or impossible to convince the multitude, and even medical men, that in such cases as those which I am now discussing, water, or a moist soil, can produce disease and fever, or that it is in reality a source of Malaria when in such trifling quantities, or under such common and neglected circumstances, similar doubts, or repugnance, or ignorance, have prevailed at every period, from that at which the evil was a maximum; while every successive improvement or drainage has produced that conviction to a more enlightened posterity, which argument then, as now, would have failed to effect. If, in the cases to which I allude, the evil should have even become a minimum, which is not the fact, it would still be an evil, while, in reality, it is not a small one; and while the whole is but a concatenated series, an affair of majus and minus, there is as little reason why we should stop short of all that improvement which is practicable, as there was for interrupting the chain at any one point, and deciding that, there, in that proportion or that peculiar condition, water, or wet ground, had ceased to be pernicious.

With a view to this fact, this series of gradually diminishing evil, of successive improvements in the condition of land, in our own country, and also elsewhere, attended by a diminution of diseases equally progressive and proportional, and therefore proving a gradual diminution in the generation of Malaria, it would be neither unamusing nor uninstructive to trace the corresponding progress of health and drainage; while it would, however, occupy more space than I dare bestow on it, and since the truth of the facts is too obvious to be disputed. A very few noted ones may, however, be mentioned in illustration; while the success of that which has been done, though this can never again be obtained to the same extent, holds out encouragement to such further attempts as are yet wanting: the neglect of which is not justified by the conviction that little remains comparatively to be effected, since in the present state of society, a small quantity of endemic disease is, for many obvious reasons, as great an evil as a much larger one was when human life was of less comparative value, as implying both less happiness and less utility, and held also under less secure a tenure; while it is not questioned that the protection of the public health, is not less the duty of an economist and a politician, than it is a duty of mere humanity.

It would require a long chapter to point out what has been done in this respect, even over a small part of Europe: and even a mere sketch respecting Holland would be one of no small length. In France, similarly, it has been an object of unremitting attention to the government, as it has occupied the exertions and the funds of many private individuals; the public decrees to this purpose commencing with Henry the fourth, and being repeated under successive monarchs, down to Louis XVI. in 1791, and subsequently, under Napoleon, in 1807, 1811, and 1817. The great embankment of Rochelle is one of the most conspicuous of these works; and as a few other examples out of many, I may name the drainage of the marsh of the Chartreuse at Bordeaux, already noticed, the reformation of Montbrison in the Lyonnais, once the very type of this pest, by filling its ditches and erecting "boulevards," and the drainage of Chatillon in Burgundy; an operation from which the population has doubled within thirty years.

Nor has Paris gained less than London in this respect, and by operations still more directly carried on with this very view; since it must really be admitted, that it is to indirect means that we are indebted, not only in the capital, but almost every where else, for all that we have gained on this point: there having always prevailed among ourselves, that neglect, ignorance, incredulity, or contempt as to Malaria, which is even now so remarkable, and which, at this very day, refuses to believe that it is a cause of disease demanding and admitting correction. The history of Italy on this subject has occupied volumes, and I must refer to Prony and others for what it is impossible to quote: while it is not perhaps the least instructive part of this history, that in consequence of the suspension of the work which had been commenced under Napoleon in the Pontine marshes, the Malaria is as virulent there as ever, though some land was rescued to agriculture.

On this point, the improvements of England in this respect have been immense, almost even within our own memories; undertaken, it is true, chiefly with agricultural objects, yet marked by a concomitant disappearance of disease, which would seem almost incredible were it not well authenticated. We can scarcely indeed look into English chronicle history without meeting the amplest evidence of this; and from such and similar records, Short, Heberden, and others, have collected many striking facts, of which I may here name a few. On Burnet's authority it rests, that in the reign of Mary, the intermittent raged like a plague; while we have medical testimonies to the same purpose, in the writings of Morton and Sydenham; of whom, the former says that these diseases were peculiarly destructive between 1658 and 1664. Between 1667 and 1692, two thousand persons appear to have died in London of dysentery, from the evidence of the bills of mortality; and it is a chance if, in the same extent of population, there is one who thus dies at present. Even far later, that is, between 1720 and 1729, the whole nation, according to Dr. Short, was "grievously afflicted with fevers of this nature; when, at present, so rapid has the change been, we hear no longer of national epidemics; though somewhat, as physicians know, must also be allowed to other improvements in the modes of life. At present also, an instance of death from mere intermittent is exceedingly rare; whereas, according to Short, among forty deaths from fever, between 1629 and 1636, one was the effect of ague; while in 1750, that proportion was not one in a thousand. That, as far as London is concerned, this has been chiefly the effect of the sewer drainage, is demonstrated; though much must also be allowed to similar operations in the flat lands to the eastward of it, or generally along the banks of the river. When Sydenham relates that the ague was frequently fatal in London in his own day, he did not probably foresee that such an event, at the present day, would be esteemed little better than marvellous; nor let us persist in shutting our eyes to what yet remains to be done; or, whether from indolence or that pride which refuses to learn or admit what it has not before known, refuse to exert ourselves in exterminating the last remains of these causes of disease, as far at least as they are within our power.

It has been suggested that a parliamentary inquiry into this subject might advantageously be adopted; since it would be little more than a sanitary measure, justified by other practices respecting the drainage of lands in general, and by the laws respecting imported contagion. It is probable that it would be attended with advantage; while the inquiry needs not proceed to legislation. Such an inquiry is one of the most conspicuous and impressive modes of calling the public attention to measures or conduct in which their own welfare is concerned, and where, nevertheless, it may not be expedient or easy for legislation to interfere.

As far also as the greater cases are concerned, or the extermination of disease by the drainage and improvement of extensive tracts of noxious land, (since with respect to the smaller pernicious spots, no legislation, even in a despotic country, could easily act,) I may borrow a remark from Italian, but chiefly from French, writers; though little applying to ourselves, among whom, while so much has already been effected, it is not the usage of government to perform any thing which can be executed by the combined or private efforts of individuals; being content, and judiciously, as the event has proved, with limiting its exertions to the legal protection of all parties. The remark in question alludes to the policy which wastes its means in foreign colonization, forgetting to extend by exertions and expence that would not be greater, and often much less, the territory and the population which it possesses at home; suffering its own marshes to lie waste that it may occupy foreign ones, and, what, above all, it seems ever to have forgotten, forgetting that a population which is not healthy is an evil and not an advantage, to the state as to the people themselves; and that if the wealth of the people is an object to government, not less is it responsible for their health, since, without this, even industry must be cramped, and misery become the lot of those who demand and deserve from the state that happiness which they know not how to attain, or cannot, by themselves, command.

CHAPTER V.

On certain obscure and disputed cases relating to the production of Malaria.

In this chapter I propose to notice some doubtful or disputed facts, and some difficulties which attend this subject, that I might not disturb the evidences as to what has been fully proved or invariably admitted. It is therefore a collection of unconnected matters; while, among them, the reader will, I think, perceive that there are facts which ought not to have been disputed, as he will also conjecture that what may appear obscure, has probably been rendered so by ignorance, or else by inattention to the necessary particulars on the part of the reporters.

The condition of Egypt, whether in its state of quiescence or inundation, the natural state of its Deltas, and that which takes place on its inundation and drainage, are too well known to require description. Examining this case *a priori*, we ought apparently to decide that its moist delta should produce as destructive a season of remittent as the worst parts of southern Africa, that during the north winds it should even generate abundant intermittent. We ought to decide that as its inundation is a swamp of the worst kind, to the eye, and its drainage a marsh, the result should be a wide devastation from all the usual diseases of tropical climates. There are fevers and dysenteries it is true, and they appear, as might be expected, on the retiring of the water; but they seem to bear no proportion to what might be expected, if indeed we may venture thus to judge from the general reports of travellers who have not been physicians. It is probable that the universal agriculture may assist in solving this difficulty; for, as before remarked, this is everywhere a remedy against Malaria, as it ought to be on principle, by occupying, in a manner which is much less pernicious or hazardous, land which would otherwise produce an injurious vegetation. On the plague, I ought not perhaps to indulge in any remarks; but no one can yet believe that this is the produce of a vegetable miasma, were it even satisfactorily demonstrated to be the peculiar produce of Egypt, when no disease produced by such miasma is known to be contagious, and when this, in spite of recent party and paradox, is one of the most actively contagious disorders existing [illegible]

Inasmuch as two diffi [illegible]

are always preferable to one, in philosophy, as more likely to be under the guidance of some general and discoverable law, it will not be an addition at least to that of Egypt, to say, that, by the reports of travellers on certain parts of the East, the drainage of lands that have undergone their annual inundation, is not invariably followed by the diseases that might be expected. There are few travellers whose observations are more apparently accurate, simply expressed, and unbiassed by all previous views, than Captain Hamilton, a century ago; and of this nature is his report respecting the periodically inundated lands of India east of Bengal. But if this seemed at one time confirmed by the account of Captain Symes respecting the rise and fall of the Irawaddy and of the lake of Amarapoora, we have now reason to know that this country claims no exemption from fevers; and further knowledge will probably prove that the same is true throughout Cambodia, Cochinchina, Siam, and all the countries of a similar character in Eastern Asia. If a recent traveller has expressed his surprise at the occurrence of fevers in the Maremma of Tuscany where the land is not only free from lakes and rivers, but absolutely dry, and if, building on this, he desires to represent the origin of Malaria as involved in mystery, it will soon be obvious, if it is not so already, that this imaginary mystery is the produce of inattention or ignorance.

And as the same answer will serve for all such cases, I need not dwell on other parallel reports respecting other mysteries, similar or analogous, which are to be found, not only in books, but in the popular opinions, in our own country as elsewhere; errors into which physicians of high reputation, and of even the experience of Lind, have fallen. Such errors have sometimes arisen from neglecting some or other of the obscurer sources described in the last chapter, and, at others, from ignorance respecting the mode in which Malaria is propagated by the winds, and the distances to which it is conveyed: a subject which will be fully discussed in the seventh chapter.

In the mean time I may remark, in explanation of such mystery, that, in a case which will immediately come under review, Rome receives its Malaria by a propagation of a peculiar nature; as the high lands of many places receive from the low grounds at hand, what does not, comparatively, affect the inhabitants where it is produced. And thus also, when it is a subject of common marvel why ague should occur in London, it is forgotten that this city is entangled in some measure among low meadow lands, and exposed, in particular, as the last few years have proved, to the pernicious influence of those to the eastward. And if any one will be at the trouble of noticing, in the neighbourhood of this nevertheless healthy city, such tracts of land, together with the petty spots which, on the grounds here stated, and confirmed by the French writers, can produce this poison, he will have little difficulty in accounting for those fevers, in particular, which, in the last summers, have been so prevalent, at least in its outskirts, at different parts.

It is thus that I find the highest parts of Brittany to be subject to inveterate ague, even on the summits of granite hills reported to be dry land, as, for example, at Carhaix. Thus also was it reported that certain hilly situations in Wales were productive of agues, and, as was thought, without a cause: but the slender observation which detected that cause in this latter case, would probably have discovered it in the former, and in hundreds more, equally objects of surprise or mystery. Let the ground be carefully examined, both on the spot, and in the neighbourhood, and let the possible propagation by means of the winds be also traced, by the rules deducible from what I shall hereafter say on that subject, and it is probable that the far greater number of these imaginary difficulties would no longer want their solutions.

Thus, also, had I not a repugnance to specify places and lands, where the owners might think themselves aggrieved by a public notice of defects which may occasionally detract from the value, whenever this subject shall become an object of general attention, I might point out in Wiltshire, and not only there, but in counties and places as little suspected, spots at a considerable elevation, entirely free from marshes, or even the suspicion of an unhealthy soil, and which are, nevertheless, annually, and within the last hot summers, in particular, subject to severe fevers, and this amid a rural and dispersed population. The resident apothecaries call them, as usual, typhus fevers, and, naturally enough, are surprised at their occurrence in such circumstances. The reader can now, I trust, give the just name to the fever; and, as to the cause, it will be sufficient if he is now informed, that from the form of the land and the nature of the subsoil, the pasture lands in question are, although elevated, or rather truly hilly, so soft or wet as to be constantly poached by the feet of the cattle. Here, there is an unobserved, or an apparently mysterious cause, and, I doubt not, a very common one; as little suspected as observed; while the proof, as I have given it, is perfect, except to those who are still in that state of ignorance or obstinacy which cannot understand or will not believe in marsh fever; persons to whom a few weeks of French or Italian experience would be of no small utility.

But there is one mystery for which I can conjecture no solution, while it rests on great authorities, and while every imaginable circumstance is present that ought to render the land in question one of the most pestiferous spots under the sun. It is a collection of jungles and woods and marshes and rivers and sea swamps, and it is a flat land under a tropical sun, and it is the land of monsoons; and yet it is a land where fevers are unknown. And this land is our new settlement of Singapore. I dare not attempt to controvert such testimony, and must try to believe what I cannot understand: but others may, for aught I know, be inclined to suspect that some favouritism, not perhaps inexplicable, has dictated this report.

I may now dismiss a branch of this chapter, which I would gladly have omitted altogether, had it not appeared absolutely necessary to notice what I believe to have much oftener arisen from inattention, and from ignorance respecting the natural history of Malaria, than from any radical difficulties inherent in the subject. I may proceed to the consideration of the causes which have been doubted, but on which, it is probable, no doubts ought longer to exist.

Though it has generally been a popular opinion, that putrifying vegetable matters, under whatever circumstances, generated fevers, and therefore Malaria, while, as I formerly observed, the very smell of such putrefaction was, and is yet, esteemed by the vulgar to be the cause, or at least to be an essential circumstance, many physicians had considered the presence of a living vegetation necessary; while some were even inclined to deny that the ordinary putrefaction of dead vegetable matter attended by stench was capable of producing this poison. But the history of the remittents of New York has decided this doubt; that is, in as far as it is decided that none of these fevers were the contagious, Bulam disease; since it is impossible to refuse assent to such observations as those of Rush and the other able physicians who were, so long and so often, watchful spectators of the rise and progress of this disease. Here, it was ascertained that the putrefaction of coffee, pepper, potatoes, &c. were causes of the fever, or that they actually generated the Malaria in question; while the facts, as stated, seem to confirm a suggestion which I formerly made, namely, that it was not a matter of indifference in this case, what was the nature of the plants growing in marshes, or in soils capable of producing this substance.

The fact, in a general view, is an important one, if it is thus admitted to be proved; as it betrays the existence of numerous, local, and generally accidental, sources of Malaria; not only explaining the occurrence of many single cases, but even accounting for occasional epidemic or endemic fevers; and adding also to this knowledge, a catalogue of precautions, so essential in the prevention of those diseases. It would be tedious, and indeed superfluous, to enumerate all the cases in common life where vegetable putrefaction may generate Malaria and fever; but a few examples of what is most common and most likely to be injurious, or neglected, will be of use: while from those selected examples, perhaps, a sufficient knowledge of the subject for all useful purposes may be derived,

Of these, one of the most common in many parts of Europe, and far from rare in our own country, is the process of soaking flax and hemp; the offensive nature of which is well known. The proofs of the pernicious nature of these operations are so numerous and decisive as to leave no ground for doubt, in spite of the theoretically puerile objection of Zacchiroli which I had occasion to quote formerly. Of pointed facts beyond number, related both in France and Italy, we find in Lancisi, that numerous severe epidemics in the latter country have been traced to these operations, and, among the rest, a noted one at Ferentino, and another at Orvieto which lasted many years. In the former country, out of similarly numerous cases, severe intermittents broke out in the plain of Forez in 1823, after October, (a very rare occurrence,) and were traced to this cause; and we have the assurance of M. Bourges, that it is invariably pernicious, while he describes one very marked case where fevers occurred in a dry, sandy, and otherwise healthy and elevated situation, being regularly renewed with the steeping and drying of the hemp, and disappearing when that season was over.

In Germany also, where this manufacture is extensively carried on, it seems to have been most satisfactorily proved that fevers, and of a very bad kind, are the result: a fact which, with very many others, tends to establish the opinion elsewhere noticed, that the severity or nature of the resulting fever, in whatever way it may be influenced by climate and other causes, is probably also dependent either on the nature of the particular Malaria, or on the quantity in which it is applied. That, even in our own country, some regulation of police is called for respecting this subject, has often been said, and with reason; since it is scarcely amenable to the common law of nuisance, unless under that engaging laxity which characterizes English Common Law; and if, as is decidedly said, the process in question can be much better effected in running waters, and also without poisoning the stream, although not so rapidly, there are at least many places where this method might be substituted with a double advantage.

To the ascertained poisonous action of the refuse of the Indigo manufactory, many more might easily be added, of a similar or analogous nature; but the general principle being admitted, there will be no difficulty in applying it: while if an accuracy of observation which has never yet been exerted on this subject, any more than on that of small spots of wet ground, shall become common, instead of our remaining satisfied with imaginary causes of fever, it is probable that many very unsuspected cases of vegetable putrefaction, such for example as even that of a garden dunghill, will be found to give rise to those disorders, of which the origin is at present so generally mysterious; together with the consequent advantage of prevention, in many instances.

It does not seem to have been thought that Malaria is generated in water casks, or by that action of water on mere wood, which occurs in sea voyages, eliciting a well-known smell, and producing hydrocarburetted gas; a process so long misunderstood, even by chemistry, to its disgrace, and, even yet, not comprehended by those who are most interested in it; who attribute to the water what they should seek in the cask, and whose notions as to the superiority of Thames water, are on a par with their philosophy about Bristol water, and about all else which belongs to this most simple subject. This is a question which must remain for further inquiry; while it must in the mean time be considered a suspicious circumstance, and if so, applicable also on shore in similar cases, or where rain water is kept in spoiled casks. The suspicion arises chiefly from what I shall immediately point out as to bilge water, of which, in ordinary cases, the cause is the same; while, in a chemical view, we cannot see why there should be a difference, or why decomposing wood should not generate Malaria as well as other decomposing vegetable substances; inasmuch as there is no steady and essential difference between the vegetable elements in the case of wood and of the other portions of a plant, or of herbaceous plants in general; nor any apparent reason for doubting that the fragments of wood are, in the tropical climates, as active in this mischief as the leaves or other parts.

Whether, if even thus produced, it is capable of acting so as to generate disease, is another question, and perhaps more complicated than at first appears. Yet, if a brief exposure to the Malaria of marshes can excite a fever, as I shall hereafter show that it does, or if a small quantity of the poison, or a single inspiration, is sufficient for this purpose, it is perfectly conceivable that the air in question may similarly affect a person immediately exposed to it by close communication with such a cask, whether at sea or on shore.

This is easy to understand; but there is a difficult question still remaining: and that is, whether the drinking of such water can produce the same effect, or whether the Malaria, if it contains Malaria, can act through the stomach as well as through the lungs. It is the same question which relates to the use of bad water in tropical climates, as it also involves the greater one, viz. by what ways Malaria does or can enter the body; and as I have been compelled to examine these elsewhere, it is unnecessary to speak further respecting this matter, at present.

But if the putrefaction of wood in water-casks at sea, though not yet suspected of producing fever, can scarcely be deemed innocent, the same suspicion attaches more strongly to the case of bilge water; very particularly when produced from the leakage of sugar, where it is known to be highly offensive. It has not, as far as I know, been ever demonstrated, nor indeed much suspected, that the fevers of ships were produced from this cause; while, whenever fever does occur in such a situation, it is generally, or perhaps almost always, viewed as a typhus and a contagious disease. The error itself is easy; and while it is one also strongly aided by prejudice and habit, it is plain that the remittent might, as thus occurring, be so mistaken without any great stigma on the discernment of the practitioner; as it would be difficult to ascertain that numerous cases of fever, breaking out in this manner among a crowded crew, were not propagated from one person to another. Yet the distinction is of great importance, for many obvious reasons; nor need I point out further to medical men, how necessary it is to ascertain what the truth actually is on this point. To maintain, as there seems at present a tendency to do, in a sect which appears to be now seeking notoriety by paradox, that there is no such thing as contagious fever, is assuredly to attempt to establish a most dangerous doctrine; but if we unite all the evil consequences, it will be found that not less inconvenience follows from ranking under this head, as is daily done, thousands of cases of remittent.

In truth, it seems to me that the evils are greater; for it is thus, among other things, that the means of prevention are overlooked; while, if those who thus argue against the non-contagious nature of fevers, have unintentionally confirmed the opinion which pervades this work, they have not seen the whole truth, nor seen it in that manner which would alone render their opinions useful; not inquiring into the real cause and nature of such fevers, but most generally attributing them to fanciful ones, and acting rather under the spirit of opposition than in that of philosophy.

If, however, I cannot exactly prove that bilge water is capable of generating Malaria and fever, I am not at least very far from that proof, since the mortality in sugar ships is always notedly greater than with any other cargo, and has often been most destructive; while I need scarcely repeat that it is notoriously the very worst of cargoes in this respect. And the opinion is further supported by a great mass of facts occurring in merchant ships and in the navy; while their numbers may perhaps compensate for their want of speciality. The general experience is, that a foul ship, and foul, as ships are, from bilge water chiefly, is invariably a sickly ship, and that vessels of this character, falling under the command of an attentive captain whose rule it has been to wash the hold by means of the plug, daily, till the water came up as transparent as the sea outside, have recovered their health, as they have also remained free from disease. Such was the rule, for example, of Sir Henry Baynton, who cannot object to see his name thus quoted for good; and such was the rule of Captain Smyth, who during his long and well known services in the Mediterranean survey, never experienced fever, on any occasion, on board of any one of the various ships which he commanded. I may bestow the same praise on Parry, as also on his great predecessor, Cook; while among hundreds of examples of the reverse, far too easy to find, I shall notice but one, since they are not so agreeable to point out. This occurred on board of the Powerful, a seventy-four; which was entirely disabled by sickness, by fevers, during her passage from the East Indies, while, when examined, her ballast was found to be, from neglect, a mass of putrid mud, the unquestionable cause of all this evil.

In reality, I entertain no doubt, that while we *must* suppose contagious fever to occur occasionally in ships, from various obvious causes, the great and frequent mortality in them has ever proceeded from this very cause, Malaria, the Malaria produced by neglect of cleanliness; and that the fevers so generally reputed typhus, have been the remittent thus generated. Hence also the frequent failure of fumigation; as this can possess no power against a daily productive and ever renewed source of disease: though it might produce the expected effect for a day or more. Against that, there can be no remedy but to extirpate the cause by absolute cleanliness in the hold, or by the constant use of the plug: while I entertain no doubt, that if this rule were made imperative on all commanders of vessels, not only in the Navy, and under a fixed regulation of the Admiralty, but in the merchant service, by ship owners, and very especially by the West India trade, the fevers which are now so frequent would disappear.

There can be no other causes of remittent fevers at sea; the case of tropical harbours being of course excluded: and if, in addition to this care, it were also a rule to fumigate every vessel with sulphurous acid before leaving port, for the purpose of destroying any casual contagion which might have found its way on board, taking also such obvious precautions with respect to the crew as do not require to be described, it is almost impossible that what, almost alone, deserves, as it receives, the name of sickness, at sea, should exist; while an immense mortality, injurious, and deeply inconvenient, in far more modes than the mere waste of life, would be prevented, hereafter, and for ever. They who know the history of commerce, or of navigation under whatever forms, know well what has been thus suffered, and is, daily, suffered; and they know too, that if fevers are but excluded, the diseases of the sea are, in the present day, nothing.

I cannot cease to wish that these opinions were more widely promulgated; convinced that in stating them, I am offering the means of widely saving human life; and not only so, but of preventing those losses of property, of commercial wealth in various modes, and those disappointments, not merely in trade, but in naval warfare, which are but too well known to those who know what has been the history of our naval wars. The spirits of tens of thousands might join with "Hosier's Ghost," in remonstrance to those from whose neglect or ignorance it has arisen, that their bodies were committed to the deep, the unhonoured victims of pestilence, not the bold defenders of their country's glory.

I know not where, better than here, I can also introduce another cause of Malaria little noticed; one at least which is universally believed and asserted to be a cause, by the French physicians who have bestowed most attention on this subject. This source of fevers is found in the dunghills and pools so common at the doors of farmhouses, and more especially of cottages and petty establishments, in almost every country. That, in common with sewers, ditches, and other similar repositories of putrefying vegetable matters, they do produce autumnal fevers in France, is not only believed, but, as far as we can trust those reporters, fully proved; nor, after all that has here been said on this subject, is there any reason for doubting the fact. If it be equally true in our own country, as may equally be suspected, especially in hot and peculiar seasons, it offers a new argument against this discreditable fashion; while it may also explain many of the fevers occurring in the country every year, where no obvious source of Malaria exists, and which, as usual, are reputed as typhus.

In how far mere mud, the apparent produce of the sea, or left by the recess of the tide, in ports and estuaries, and at the mouths or on the banks of tide rivers, can or does produce Malaria, is one of the questions on this subject which has been argued on different sides. That such mud, appertaining to fresh waters, and laid bare by the summer heats, in lakes, pools, and canals, does produce fevers, and of a very serious character, has been formerly shown. In such cases, it might be easily conjectured, and is in fact known, that the mud contains, not merely vegetable matters in a state of decomposition, but animal matter also; though in how far animal matter can produce or aid in the production of Malaria, is a point which has never been decided, however often it has been suspected, and even asserted. Now with respect to marine mud, it cannot be supposed that clay and water alone could give rise to this poison, so that it is easy to understand where the exceptions would be found; while if it contains putrefying sea plants, there is no reason why it should not be as pernicious as the mud of lakes, inasmuch as the presence of salt is no remedy, here, more than in the case of salt marshes. Or, as it is the effect of tides, in estuaries and similar circumstances, to reject, and often therefore to expose the mud brought down by rivers, it is plain that, even without the presence of marine plants or their remains, such mud must often be in the same circumstances as that of lakes in summer. In our own climate indeed, where the heat of the sun is less likely to operate an injurious effect of this nature within the few hours of low water, such a result is less likely; while deceptions may easily arise in this case, from the fact that, in those situations, there must often be marshy land in the neighbourhood, or, as in Southampton river, exposed banks of living Zostera, acting probably the part of a marsh.

But though I have formerly remarked, that odour, or the smell of putrefying vegetables, is not an exclusive test of the presence of Malaria, and is assuredly not necessary to its existence, any more than that the fetid gas is itself the poison in question, a remark which is further completely proved by the fact that marsh lands emit as bad an odour in winter as in summer, and yet without producing disease, we can never consider as safe, those sea ports, generally dry harbours, which emit the smell of putrid sea weed at low water; while, most of all, are those suspicious which receive the sewers of the towns themselves. It may even be suspected that to manure land with that substance is not a safe operation; while as to the former case, there is evidence in abundance, even from Europe, even indeed from England, to prove that fevers, and in summer as usual, are the actual produce of sea ports or harbours under these circumstances.

In France, and in Holland very especially, this has been proved in innumerable instances; and, in fact, many of the most severe epidemics of this latter country have been traced to this very cause, the exposure of sea weed, whether on the shores or in the interior lands. In the Mediterranean, the nature of the tides is less likely to produce any very conspicuous effects of this nature, yet they are far from being unknown; and as to our own country, though they may be less common or marked than in France, I have no doubt that the fevers so common in sea ports are in reality owing to this very cause; while, by the usual error, they are always reputed as typhus, or as contagious disorders produced by poverty, want of ventilation, and the other circumstances attached to such places, and so often unjustly accused of what is not their consequence. In how far any modes of prevention might any where be derived from this view, it would be impossible to inquire, except for each particular case; but it is the fundamental step of greatest importance to assign the real cause, and the real nature of the fevers so universally mistaken.

I know that the case of Venice has been adduced against this opinion; but whatever was its freedom from disease in the classical times, as, in in consequence of a different state of things often here noticed, was then true of many other parts of Italy, it is not true that Venice is now free from summer fevers, while it is a fact that its unhealthiness has been gradually increasing for a long time past. Even were it not so, the slender vacillations of the Adriatic tides would prevent any great exposure of mud in this case; and thus explain the exemption: while it is not less notorious, that from a peculiarity in the currents in this singular place, the lagunes are freed from that mud which would otherwise accumulate, and produce what has happened in so many other places, even on this shore.

That mere mud, maritime as well as terrestrial, containing vegetable matter, yet free from any herbaceous or closely investing vegetation, does produce Malaria of the most destructive nature, in the tropical regions, or under appropriate circumstances of climate or heat, is amply proved, if further proof were necessary, by what occurs in the Mangrove rivers, whether of Africa or elsewhere. In such situations, it is well known, this tree forms dense and extensive thickets or forests, if forests they can be called, through which, at high tides, the trunks, such as they are, are found rising out of the water, producing such an effect to the eye, as might happen with us from the inundation of a wood; while, on the recess of the tide, it is seen that they are rooted in this bare mud, which they serve to retain and consolidate; thus becoming important geological agents in the extension of the alluvial lands of the rivers.

Now, on this subject, I have carefully cross-examined intelligent naval officers, and it has been their decided opinion that the cause of the fever, or the Malaria, so frequently and extensively fatal to the crews of boats when sent up these rivers, was extricated during low water, and from the mud, while it was attended by a peculiar smell, described rather as an earthy than a putrid one. And that opinion is confirmed by the fact, that in cases where such a river-course extended for miles, no other source of Malaria could be present; while mere approximation to the thickets, from the sea, was sufficient to produce the fever, and almost instantaneously, provided the mud was bare: the navigation of such a stream being safe at high water.

In such cases, unquestionably, the cause must be sought in the decomposition of the vegetable matters which are mixed with the mud: fragments and leaves from the trees themselves, together probably with analogous matter brought down by the stream. Yet, that in such extreme cases as this, the smell of vegetable putrefaction is not present, serves to prove also, that putrefaction, in the proper sense of the term, is not necessary to the production of Malaria, but that the stage, or mode, of vegetable decomposition required for the production of that poison, is different from that which generates a fetid gas. As I remarked before, the two may co-exist, possibly in different places or parts, at one time, possibly even in the very same place or substances; but we must not consider the smell of putrefaction as necessary, or imagine ourselves secure because it is not present. Or, the gas which is Malaria may be mixed with the fetid gas, or else either may exist without the other: while the process of decomposition may, and even at the same period, or stage, for aught that we know to the contrary, produce either the one or the other, or both united. Here also there is an analogy to the matters of contagion. These, all of them, it is well known, can be present without being sensible to the smell: but they are often also united with some matter producing fœtor, as such smells may exist, even in great intensity, without including the matters of contagion.

Though, in a former place, I was compelled to notice this question as it relates to sewers and drains, from their connection with the ordinary agricultural works of a similar nature, it is one which might equally have found its place here, thus intricately are all those subjects connected. These are cases, properly, of mud without actual vegetation, or of the decomposition of dead, and very frequently of disorganized vegetable matter; and the whole serves to prove that a living vegetation is not necessary to the production of this poison. If Fleet ditch was ever the source of disease that it was supposed, it is one out of numerous proofs on this subject; while I need scarcely repeat here, that the pernicious character of such receptacles, both close and open, has been a prevailing opinion among physicians at all times and places, however often the nature of the fevers produced by them may have been mistaken: while a variety of facts connected with the police reforms and previously neglected condition of towns, if far too numerous and often too loose to be quoted as proofs, seem amply to justify, from experience, that the air extricated in such circumstances, if it be not all Malaria, or always containing that substance, is frequently a real cause of the fevers of this character which have so notoriously prevailed in ill-regulated towns.

To pass now from the question of mere vegetable putrefaction, there is an assertion respecting the production of remittent, of a very different nature, in which there may, or rather must be, a fallacy involved. According to the testimony of African travellers, and of Park in particular, it is produced immediately on the fall of the rains, as if the mere contact of the rain itself was the cause. Such indeed appears to be his opinion. I cannot deny here what I have not seen; but it must be recollected that this rain falls in a climate and at a moment when the whole atmosphere is, or has just commenced to be one mass of Malaria, and that in the circumstances noticed, it would always be at least an accessary or predisposing cause. In this case it may be no more, if it be even that.

The facts, as more accurately stated by other travellers, and also in some measure by himself in other places, seem to be, that as the vegetable decomposition necessarily active in so hot a climate, commences as soon as the ground becomes wetted, the generation of Malaria begins, perhaps even on the first day or hour; and that, in this as in every other case, it is but the produce of a vegetating soil, rendered suddenly marshy or wet under a high temperature. That this is the view entertained by the natives themselves, is plain, from the care with which they retire to their houses and endeavour to exclude even the least access of the external air: judging, what is probably true, that the whole atmosphere is one wide body of Malaria. As the rain increases, however, and the ground becomes thoroughly wetted, the diseases diminish, returning again as the retiring of the rains allow it to dry. Hence it is, that in Africa and elsewhere, the greatest influence of the Malaria takes place at the end of the rainy season; and thus also it was on the retiring of the waters after the rains and the inundation, that the great mortality commenced among our troops at Rangoon in October.

This fact is, in another sense, of some value, as tending to explain what I formerly remarked respecting the occasional increase of Malaria in certain parts of Europe from attempts at drainage. It serves to show what was then suggested, that a very wet state of the soil was not so injurious as some one intermediate between complete inundation, or swampiness, and absolute dryness.

And if it is easy to see, without a more minute explanation, how it bears on this, and on many collateral or similar cases readily affiliated to it with a little reflection, it is a fact also which illustrates in that satisfactory manner which is always the result, as it is the proof, of a philosophical principle truly assumed in science, all these facts of an analogous nature which occur in our own country. In Africa, as in other tropical climates, if there is neither spring nor autumn, these two periods, as far as they relate to the production of Malaria, are represented by the falling of the rains and by the retirement of the waters; while they may be separated but by a few weeks, instead of being placed, as with us, at an interval of half the year. The analogy is maintained throughout; and the consequences are the same, varying chiefly in intensity or degree. I need not detail the points of resemblance more minutely; while the differences, and their causes also, are obvious.

There is yet another common opinion on this subject, which seems to imply a decided fallacy of observation united to a prejudice, and to which I alluded not long ago. To drink bad water in hot climates, as is a necessarily frequent occurrence, is so commonly reputed a cause of fevers, that it may seem hazardous to question its truth. But whatever accessary ill effects this may produce, it is always forgotten that this bad water occurs, only, or chiefly, when the land is of such a nature as to be in itself a source of Malaria; as the cases recorded are never those of the brackish or half putrid waters of the sandy deserts, but of those of low and marshy lands, or of situations where, with any water, fevers would be produced. Were the water alone, as drink, the cause of fever, it should occur equally in all places, not only in the deserts of Africa, but in numerous cases, in towns, where, nevertheless, this consequence has not been observed. That such waters may produce diarrhea, is not denied; but even here, there is a wide difference between such a disease and the dysentery of Malaria. On this illustration however I must not lay any stress; having already placed it among the facts demanding further investigation.

I am not aware that among what else I might have recorded on this subject of obscurities, there is any thing more so very far differing in principles from what has now been stated, or so very material, as to justify me in prolonging this part of the present chapter. If I have omitted any thing on which I might have explained myself further, I do not imagine there can be aught which will not be easily understood now, from a due application of the leading facts which have been discussed. Yet I will not conclude without one further note.

It is a popular prejudice in Italy, that volcanic soils are especially productive of Malaria, or rather, that they are intrinsically capable of producing it. On what principles, it may be asked? If this be mere assertion, a counter assertion is not more worthless; and neither deserves attention. If it is matter of evidence, it must either be admitted, or met by counter proofs. I possess no knowledge either way; but it is the duty of the Italian theorist to see that he has not overlooked essential circumstances, and, here also, given as a *causa pro non causa.* When another philosopher of the same stamp asserts that the production of Malaria is here regulated by a mine of pyrites, and so forth, extending from some place to some other place, it is not difficult to know what to believe. The truth, as to the former fancy, may probably be, that the soils of this class are the most fertile; but as it is a subject not worth inquiring of further, I shall terminate this chapter with the examination of a somewhat intricate question relating to Rome, as it relates to the production and effects of Malaria.

The relative states of ancient and modern Rome, and of the neighbouring country, with respect to the production of Malaria, as indicated by a difference, real or imaginary, in their salubrities, would, if the superiority of former times in this respect were really proved, offer a difficult problem on this subject. That such an opinion has been entertained by some writers on this question, will not however prove that the fact was so; but as it is a very entangled inquiry, and as I do not conceive that we have yet attained that degree of knowledge as to the causes of Malaria which will enable us to pronounce decisively on either side, I shall detail the necessary facts as briefly as possible, as they can be collected from the classical writers. That Brocchi has supposed ancient Rome to have been more healthy, yet not less subject to Malaria than the present city, explaining the supposed fact by a difference in the mode of clothing, is a solution which I must examine in another place.

The ordinary conclusions of natural history will determine, in the first place, that the site of Rome, as well as the surrounding country, must, at its foundation, have been a tract of woods, lakes, and marshes; and, that such a territory must have been productive of fevers, appears an inevitable consequence. In spite of this, the city flourished and increased, while the surrounding country was also filled with a population distributed in hamlets and villages. The plain of Latium for example, which is now a desert, was, at that time and long after, rich and populous:

and thus also the lake of Castiglione, now infamous for its pestilential air, was the seat of a powerful city which long resisted the arms of Tarquinius Superbus. The ancient Laticum was situated near a marsh which is now one of the most destructive spots in this district; and the Romans erected baths beyond the Anio, in a place which is, at present, too hazardous even to be visited. The Lago di Giuturna was a favourite spot with the ancient Romans; yet in later times it rendered Castel Gandolfo uninhabitable, and was therefore drained in 1611, by Paul V. In the time of the Volsci there were twenty-three towns and villages in the Pontine marshes, of which Ardea and Lavinium were two. But as it is unnecessary to accumulate more of these specific facts, I shall only further remark, that history confirms what might have been inferred from general considerations, namely, that the country round Rome was in ancient times interspersed with what were called lakes, and which were, in fact, chiefly marshy pools; as must necessarily be the character of accumulated water in a country of such a form and distribution. And these tracts, which were then populous and flourishing, are now uninhabited deserts; although the lakes and marshes have comparatively disappeared, under different attempts at drainage, attended by various success.

With respect to the city itself at that early date, the facts are similar and the conclusions not less puzzling. About the earliest period of which we have any distinct knowledge, the town was limitted to the Quirinal, the Palatine, and the Capitol, and at the very foot of these, lay the great and the little Velabrum; besides which, we must recollect the Caprean marsh and that of Terentum, the whole forming, as can scarcely at least be doubted, a focus of Malaria and fevers. Yet, that while the surrounding country was populous, the city also increased rapidly in population, even at the earliest period, is evinced by various facts which history furnishes; of which I need only notice, that the first census by Serivus Tullus, produced 80,000 citizens, capable, as is supposed, of bearing arms; whence the general population can be conjectured. And if we examine how the fact stood as to the neighbouring towns, we shall find that Ardea, which now reckons six hundred inhabitants, was then able to raise an army sufficient to resist Rome and also to send a colony to Saguntum; and that Ostia, now I believe inhabited by a single innkeeper, became a flourishing city soon after its foundation by Ancus Martius.

Such is a sufficient statement of this class of facts. Whether the production or the virulence of the Malaria has increased in modern times, or whether the ancient inhabitants had means of resisting its influence which the moderns have not, are the questions that remain to be solved, unless some other collateral cause of this extraordinary difference can be assigned. It cannot be safely asserted that at any period of the history of Rome, the city and the neighbourhood were free from this plague and its consequences; while there is indeed much reason to infer that it was as poisonous, essentially, then, as it is now, though the apparent effects or the political consequences were less severe. This seems easily proved from history; and still we continue harassed with difficulties as to the solution of what has, to some writers, seemed almost an enigma.

It may be thought indeed, that as to some parts of this district, if not to all, the evil has really increased in modern times, not solely from the decay of agriculture arising from that injudicious political management as to corn laws, so often blamed, and from other analogous causes as often discussed, but from geological changes as to the form of the land itself: and of such facts and their consequences, to a certain extent, there seems ample proof. The joint action of the sea and the rivers will, in the case of the Pontine marshes, easily explain a change on this important point, fully adequate to an increase of the evil: and reasoning of an analogous nature may be applied, under modifications, to more inland districts.

It is also not an unimportant remark in this case which we derive from Theophrastus; namely, that the plain of Latium was covered, and especially towards the sea, by forests of laurel (bay) and myrtle, of such size as to be used in ship building; constituting, doubtless, screens to protect the country from the pernicious southern winds, and to check the propagation, if not the production, of Malaria. And while this was the fact, it is not less plain that the ancient Romans knew the value of this expedient; and thus, it is probable, was averted much of the evil which modern changes as to this point have introduced. The Law of the Twelve Tables "Lucos in agris habinto," seems to have been directed to this end; and hence also the sacred character of groves, and the heavy penalties denounced against those who destroyed or injured them. How truly this was the chief, and perhaps the only reason, is proved by what Pliny says of their property to absorb and destroy the mephitic vapours, unfounded as his theory may be. If, further, we consider the great changes which are produced in the salubrity of a country by changes in the modes of cultivation, as well as by planting, or even by the reverse, changes which even affect the general climate independently of their local effects, it would not be very difficult to comprehend now the ancient and modern conditions of the Roman territory may have been really different, while where difficulties arise on the examination of particular facts, it must be recollected that none of these can be judged of on general grounds, nor without an ample knowledge of every circumstance; as the very same treatment or change which may be salutary in one country or tract, may be pernicious in another. As to the changes of climate to which I have just alluded, the produce of various concurring causes, it will be another question how far that change in the temperature of Rome and its neighbourhood which is proved by the accounts of the classical writers, may have lent its aid towards increasing the produce and severity of the Malaria.

But it would far exceed my necessary bounds to enter further on these details; and I may merely remark that the first great territorial change appears from history to have occurred after the invasion of Attila, when the Tiber broke loose, and, from want of care, the Campagna became a marsh. The drainage was however renewed under Theodoric, by Cæcilius Decius; but on the expulsion of the Goths, this tract was again neglected, and fell back into the same state. If under a succession of Popes, commencing with Boniface VIII., and followed by Martin V., Clement VII., Pius V., Clement XI., and afterwards by Sixtus V. and Leo X., various attempts were made on the Pontine marshes, little success was the consequence; while, according to Prony's report, the efforts of Pius VI. terminated no less in a waste of money. But as I dare not pursue this local subject, nor attempt to strike the balance as to the territorial conditions of ancient and modern Rome, I may proceed, confining myself as strictly as possible to the question which Brocchi has started; the first object being to show that Malaria and its consequences were the scourge of ancient as well as of modern Rome.

By the testimonies of Solinus and Dionysius of Halicarnassus, it is proved that the first settlers were obliged to abandon the Palatine mount, in consequence of the pernicious exhalations of the Velabrum; and we are also informed by Columella, that the land near Tusculum, cultivated by Attilius Regulus in the first Punic war, was pestilential: the Malaria of that tract being probably produced by the present Lago di Castiglione. It is further probable that the larger proportion of the pestilences described by the Roman writers, were unusually severe visitations of the marsh fever; though at this distance of time, and under information which is not medical, we must not absolutely decide that some of these may not have been instances of contagious fever, perhaps even of plague. Such may probably have been the pestilences of 355 and 573, since there are facts in Livy's narrative which rather seem to justify this conclusion; and such possibly were the cases in which the city alone suffered, while the surrounding country was exempt. But allowing even much for this, we find from Plutarch, that noted periods of sickness occurred in the time of Romulus and in that of Numa, while similar ones are recorded of the reigns of Servius Tullus and Tarquinius Superbus: and when Livy says that in the short period of 173 years, or, from 287 U. C. to 460, there occurred at Rome or in the surrounding country, no less than nineteen distinct plagues, none of them at longer intervals than seventeen years, and some lasting two or three years together, it is not possible to avoid concluding that the fever of Malaria must have prevailed then in as great severity as it does at present.

But even putting aside mere inferences of this nature, we have the direct testimony of many writers of the time of the Republic, as to the insalubrity of the climate and the occurrence of autumnal fevers. Cato mentions places where it was impossible to live on account of the badness of the air; Livy speaks of tertians and quartans; and Varro advises the proprietor of an unhealthy farm to sell it at any price, and in case that was impracticable, to abandon it, unless he was desirous of being confined as a madman.

And that the country in question was unhealthy, and known to be so, from Malaria and from marshes, is further proved by the repeated attempts at drainage, even in very early days. The Consul Scaurus drained a tract of marshes on the Po, and Marcus Curius Dentatus executed a similar operation on the lake near Rieti. When it is related by historians that the armies were often obliged to quit their encampments near marshes, on account of diseases, it is evident that the fact was as well understood as it was common. That the necessity continued, and was never forgotten, is further apparent from a drainage executed by Cornelius Cethegus near Rome, and from the intentions of Julius Cæsar, frustrated only by his death. In Egypt, still later, Augustus (then Octavius,) cleansed the canals of the Nile for similar reasons, and afterwards carried on some operations towards the same end, at home. Between the periods of this Emperor and Gratian, the Pontine marshes were maintained in a dry state for 300 years; and we trace every where a great anxiety in keeping canals clean, while there is little doubt that analogous considerations entered into the reasons for constructing the celebrated but disputed Cloacæ. To put this matter indeed out of doubt, Strabo says very positively, that this healthiness was owing to the attention bestowed on drains, forests, roads, and so forth; nor need we doubt the existence of this knowledge even in times much more ancient, when we find it recorded of Empedocles, that he reformed an unhealthy district by turning the courses of two rivers, when those who, in Greece, rescued marsh lands to cultivation were exempted from all taxes and public services, and when the very fable of the Lernœan hydra and the deeds of Hercules, is but the poetical record of a successful operation of this nature.

It is true, undoubtedly, that even in the times of the Empire, the Campagna continued to be inhabited; since, during the reigns of the Cæsars, the thirty-one country tribes were dispersed in this district. Yet that the city, and the country also were unhealthy, and subject to annual fevers, is a fact so very familiar, in consequence of the numerous and well-known writers of that period, that it is superfluous to do more than remind the reader of the names of Columella, Varro, Strabo, Martial, Horace, Seneca, Galen, and of the regular migrations which all who could contrive to leave the city made to their country seats; to Baiæ, Benacus, Tusculum, Tibur, and so forth, as much for the purpose of avoiding the fevers, as from that love of the country for which the Romans had been distinguished from the earliest periods of their history.

But to end. If any thing should be urged in favour of the superior salubrity of former or early Rome, from the comparative want of records of disease, it must be remembered that there were, for a long time, no writers, and for a further long period, that they were rare: and, moreover, that professors of physic were long unknown to this rude people, since, according to Pliny, the first of these appeared from Greece in 535. Nor, from what we know of the political situation of the inferior classes, was it probably considered a matter worthy of much notice, should a few thousands, whether citizens or slaves, die in every autumn: while the blank also was rendered speedily insensible in a population almost hourly recruited from every quarter of the known world. To which I may further add, that from the crowded state of the people, in houses and streets, (a circumstance well illustrated by Gibbon,) it is probable that the ravages of the Malaria within the walls was materially checked, on the principles which I have elsewhere explained in speaking of the propagation of this poison.

With respect to the country without the walls, or the rural population generally, I have but one supposition more to offer; and if it is not capable of explaining the difference of the population in ancient and present times, as far as that depends on the climate, I must leave the solution to more ingenious persons. I have elsewhere shown, that in the same soil and under the same general state of drainage, a tract of land under the plough is less injurious than in pasture or meadow, whence it is possible that the greater salubrity of ancient times was an effect of a cultivation, forced, or demanded, to a greater extent, by the superior political condition of Rome at that time. It is also easy to imagine, that under such a state of things, many partial systems of drainage and care, added to those under the direction of the state, existed; maintained by that population which, forced by circumstances, was also preserved and renewed by that demand for industry, the elasticity of which would fill such blanks as were annually produced by disease. And if there is any truth in this latter view, one of the greatest differences between ancient and modern Rome on this point, may be rather a political than a physical question; the difference between a state of activity and wealth despising disease, and one of sloth and poverty retiring before it, and in retiring, giving it also the means of acting with an accelerating effect. Assuredly Egypt has never been without its plagues and its fevers; yet a vigorous government and an industrious people contrived to maintain, in spite of them, a condition of population and wealth which has failed only under the more exterminating Malaria of Turkish ignorance and despotism. Such also is fast becoming the fate of Venice; long noted, and even in modern times, for its peculiar salubrity, but now rapidly undergoing a depopulation, in which disease, formerly unknown or unnoticed, is taking its share; and probably destined in no long time, under Austrian love and wisdom, to become what even Rome threatens to be, or to suffer that fate under which Alexandria, once more wealthy and not less proud, has long since fallen.

CHAPTER VI.

On revolutions and changes which take place with regard to the production of Malaria, whether from natural causes or from artificial sanitary measures.

INDEPENDENTLY of the revolutions or irregularities in the production of Malaria which depend upon season, and of which I shall treat hereafter, there are others which arise from changes in the condition of the generating soils; and as these questions are of considerable importance in a statistical view, it will be necessary to examine them as far as the present state of information admits. And as the latter cause implies the remedies applicable to the diminution or extermination of this pernicious property in a soil, this branch of the subject will also find its place here, as far as it was not already noticed, and as is admissible in a work which does not profess to examine that department of general economy.

As the revolutions in the generation of Malaria can be judged of, like its existence, only by the diseases which it produces, and by changes as to their prevalence or severity, I must commence by remarking, that alterations as to the facility of its propagation or as to the direction in which it is propagated, may deceive us in attempting to decide on the absolute increase or diminution of this poison from the action of the soil itself. The cases of this nature will be deduced from the following chapter, where the propagation of Malaria is examined. It follows from all that has been said in the preceding chapters, that whenever a soil formerly dry becomes marshy or wet, from any of those changes to which the surface is exposed, we may expect an increase or a new production of this substance, while it should, on the contrary, diminish or disappear in the reverse circumstances. Practically, this proves to be true; while the latter change, following the drainage and improvement of lands, points out that process as the remedy. But the modifications of change in both these instances being various, it is necessary to specify a few of the most essential.

The simplest and the best known case of the diminution of Malaria, is that which arises from the drainage of marshes, swamps, or fens; and, to that drainage, governments and the people both, have often had recourse with this very view, since this is a part of the subject on which there are no differences of opinion. This is the great change to which we must attribute the improvements of our own island in this respect; and it is one also of which the effects are extensive throughout Europe in general; while, in the tropical climates, as well from the inherent difficulties of the subject itself, as from the wretched condition of most of the governments in these countries, little improvement of this nature can be quoted. It is probable that examples might be adduced from China; but we are as yet almost unacquainted with the geography, statistics, or history of that country, though the former at least promises now, in the hands of Klaproth, to be no longer the disgrace of our maps.

It is very well known that, in England, before the great increase of industry and knowledge, there were numerous and extensive tracts of marshy land; while if we recede to a much more distant period, the early history of Britain will inform us that this was almost the general character of the inhabited parts of the country, since it was in such spots that our savage ancestors fortified themselves from foreign as well as domest enemies. It is to the Romans that we are debted for the great and early reforms of nature, and very probably for the first ones; sin they were well acquainted with the injurious qualities of such land, and the method of remedying its evils while they also rendered it productive. That the wet tracts or marshes of Somersetshire were rescued by them, is almost matter of demonstration; and it is equally probable that to them also we are indebted for the original embankments of the Thames.

If a long blank of barbarism as to the inhabitants, and of ignorance as to ourselves, respecting the statistical condition of England, succeeds this period, neither have we any medical records by which we can prove, what nevertheless we may safely conclude, that fevers, of each nature, prevailed throughout those days of neglected improvement and agriculture, to a degree infinitely greater than they do at present. This is what we might fairly decide on, without absolute evidence; but as we descend in history, and as we trace the progress of agricultural improvement nearer to our own days, we discover, as I have formerly shown, facts enough to justify this conjecture. It is from casual reading of various kinds indeed, that we must ascertain the prevalence of fevers and intermittents during the ruder periods of our history; but when we can, by receding upwards from our own time, discover a gradually greater prevalence of such diseases, and when we find the melioration, reversely, following very accurately the progress of agricultural improvement, the whole conclusion appears to be amply justified.

To examine local details with this view in our own immediate days, would be as easy as it might be rendered long, and as it would be superfluous. The progress of Lincolnshire, and of the fenny districts in general of the eastern side of England, in respect to improvement, and of an improvement closely accompanied by a diminution of the diseases of Malaria, is so recent and so familiar, that it is barely sufficient to name it; while there is not a peasant of those districts to whom it is not even better known than to economists and physicians.

To notice here what has been the analogous history and the corresponding progress of Holland, of Germany, and of France, might afford some amusement to the reader; but the detail would not justify the space which it would occupy, while I was moreover induced to mention some circumstances appertaining to this subject in a former chapter. It would be still more interesting to give the history of the improvements of Italy in this respect, and more particularly of those which relate to the attempts on the Pontine marshes in modern days. But from a mass of materials so extensive, it is not easy to select and condense; while the whole, affording matter for volumes, might easily lead to the inconvenient extension of an essay which it is my wish to retain within moderate bounds, in the hope of rendering it more widely useful.

I shall now therefore proceed to remark, as connected with remedial objects, that while the drainage of pernicious soils is often a matter of great mechanical difficulty, as in the case of Holland and Lincolnshire, or of other lands lying beneath the level of the sea, so, as far as relates to the extirpation of Malaria, it is often also but partially effectual. The diseases are diminished, it is true, but they still continue; as is notorious with regard to our own fenny counties and to Holland, and as is no less evinced, while with a much more splendid but unhappy celebrity, by the repeated failures or the very partial meliorations which have followed the exertions of the Papal government in Italy.

The chief causes of this imperfect melioration or partial failure, will probably be often found among the circumstances enumerated in the fourth chapter; and it was partly with a view to this object also, that the somewhat minute analysis displayed in that chapter was made. To conduct a drainage for merely agricultural ends, is easy, or at least the mode and the result both, are obvious: to attempt the same for the purpose of remedying the insalubrity of any spot, be the character of that what it may, requires an intimate knowledge of every minute particular which may interfere with the expected result. Thus have I shown that the pernicious spot needs not have the obvious character of a marsh, and that it may also be very limited, or even minute; and hence, that although an extensive tract of marsh is drained, and sometimes even cultivated, there commonly remains something which becomes a generator of disease. This is almost inevitable, for example, in infra-marine fens, because the sea wall itself becomes a marshy focus of the Malaria. Still more is it inevitable in this case, from the necessary existence or construction of ditches, canals, or drains, almost unavoidably subject to alternations in the height of the water, and, in any case, even where the marsh is more elevated, becoming the unavoidable receptacles of that which is stagnant; while subject also in that case to variations of level, from the effect of heat, and thus forming petty marshes of the worst quality.

I must depend on the information of others for what I have never examined; and if that be correct, then is it probable that the pestiferous nature of the Campagna of Rome, inasmuch as it does generate Malaria, is, as I formerly remarked, more owing to its ditches than to the soil itself, which in reality is dry, at least in those seasons when the Malaria is most abundant and virulent. And such also appears to be the truth as to some other parts of Italy; respecting which, I have found in books, much more frequently than I could have expected, either a false description of the facts or a fanciful explanation, or, lastly, an attempt to involve the whole in mystery, as if the Malaria of that country was often produced by inexplicable causes. And I may remark here generally, in aid of those who may have found themselves bewildered in reading on this subject, that not only is this a common occurrence in the voluminous writers on Malaria, who are principally also Italian ones, but that while, as far as my reading extends, I have not found one luminous and philosophical view of the production and propagation of this poison, and little which can even serve the purpose of preventing diseases, so is it far too common to find entire volumes filled with idle hypotheses, respecting pyrites and volcanoes and mines, and attributing to electricity, aurora borealis, magnetism, and similar visions, what the writers had forgotten to seek in that which ought to have been obvious to the most superficial and ignorant. I trust that it will now be found a much more intelligible piece of natural history at least than it has yet appeared; and that what will be intelligible to all, will also be followed by corresponding utility. To proceed.

Another analogous circumstance relating to the imperfect cure of fens and marshes, here requires notice also, though I was compelled to touch on it before when speaking of drainages; because I believe that it is a frequent cause of the persistence of the diseases of Malaria when the great exciting causes have been removed. There are not many marshy tracts where a perfect water level can be expected, and, on the contrary, it is not uncommon for them to be irregular, or to contain hillocks and depressions, or portions decidedly lower than the general surface. Here the general drainage may be complete, or the land may even be cultivated, while there will still remain swampy spots, or, as sometimes happens in high marshy grounds, small pools. Nor is it unusual for these to be overlooked, at least in our own country, as of no pernicious efficacy; particularly should they contain clear water, and lie in a clayey or gravelly soil. Yet I have already shown that even on dry lands, such pools do excite the diseases of Malaria; and should they be numerous or extensive after the drainage of a tract of land, they may be sufficient almost to nullify the effect of that, as far as the health of the inhabitants is concerned. This, I believe, is also one of the circumstances occurring in the Campagna of Rome, and it may aid in explaining the insalubrity of that noted spot.

Having formerly noticed that Malaria is sometimes the produce of low meadow lands, it will be obvious that when a marsh is recovered to this state only, the cure of the evil may be imperfect; a case not unfrequent in France, and which is much more likely to occur in a hot than in a cooler climate, from the effects of heat in the generation of this substance. And, as I was then also obliged to point out, the cure of a marsh land is far more likely to be efficacious when, after drainage, it is subjected to the plough, than if it remained in grass; with the exception, formerly noticed, of the first breaking up. It is not only that the power of being cultivated proves the better drainage of the soil, but because this species of vegetation has a greater tendency to evaporate water and to prevent its accumulation;

while, from the removal of the crop and the drying of the stubbles, nothing remains from which Malaria can be produced. And if what is said respecting the rice fields of India be true, namely, that the poison is chiefly produced by the roots and fragments left on the ground after removing this crop, the remark is not an unimportant one, and may be applied even to the case of corn lands of this nature in European climates.

I need not proceed further with this radical branch of the present subject; but those who may be interested in the question, may possibly deduce from it, hints as to the drainage of marshy tracts, in as far as one of the objects may be the extinction of disease. Those hints relate to the number, position, and construction of drains, and also of dykes; and to the management of such plashes or pools as may arise from the irregularity of the ground. I cannot here enter into details, where every thing must be limited by expence, situation, and possibilities of various kinds; and since the remedies have been indicated, those who are interested will be able to ascertain how far they are capable of application. Let it be remembered always, that however human life may be despised in these cases, as being a mere political calculation, the question of human misery or happiness is worth our attention; while there may even be pecuniary interests concerned, since the rent of such land will always be more or less regulated by its salubrity, from many causes: and, in reality, there are some situations where land even becomes subject almost to a minimum rent, under a species of monopoly in the hands of the reckless or profligate, or among those who, from habit, are enabled to exist where competitors of another kind would perish or will not settle.

That this is true, or rather that there are various circumstances relating to value, whether as that regards labour or land, property or rent, which are materially affected, or regulated, by the salubrity of lands or localities, would be easily proved by a statistical selection of facts from various countries; while the results would even surprise those who have not been accustomed to consider this subject, or are in a state of defective information respecting it. It is a question, however, on which it would be tedious to enter; but if it is one which amply deserves the attention of landholders, even now, it is one also of which the importance will become more sensible as the knowledge of this subject is extended, and as it becomes better known that the health of individuals, as well as the public safety, is often materially in the hands of landowners.

Where the principle of evil is so simple, the theory of the remedy is at least equally so, whatever may be the fact as to the practice. Sea walls ought not, for example, to be allowed to become marshes or gardens for reeds; ditches and drains ought to be kept clean; while receptacles of water should be laid dry, by a drainage into the general conduit. Could every bank, whether of dyke or ditch, be a stone wall, for example, the remedy would be nearly complete, as far as relates to those; and such a work approximates nearest to that, when it is of earth, or is free, as far as possible, from vegetation.

These, and many similar regulations, are almost too minute to be within the power of governments, even where they have bestowed the greatest attention on the general subject. Yet they were compulsory in the days of ancient Rome; and where the state still holds in its hands those laws without which the greater improvements of this nature cannot be conducted, it might regulate; while its enactments would tend at least to diffuse the necessary knowledge as to other cases. Yet as far as our own country is concerned, the state, and the people both, must first be convinced that such improvement of the public health is possible, and that the diseases attributed to Malaria in France and Italy, are actually produced by the same cause in England. That they were once thus produced, I have proved in the preceding chapter: because the diminution of disease, keeping pace with the improvement of wet lands, proves the cause. The same diseases exist, if in less numbers; the climate is at least as warm as it was: and why then are they not still produced by the same causes? correspondently diminished, but here proved to be unconquered. England was not formerly exempted from Malaria; and on what grounds does it claim exemption now, when it possesses all the circumstances necessary for the production of that poison?

To proceed; and to the reverse case; it is plain that wherever a tract of dry land has been converted into a marsh by inundation, whether from a breach of the sea or the overflowing of rivers, we must expect an event the opposite of the preceding, or the production of this poison where it was before unknown. I need not dwell on a subject so obvious; but the history of all lands is full of events of this nature, even on a great scale; while on a smaller one, if often overlooked, it is a frequent occurrence, even in our own country, from the accumulations of rivers, even where the effect is far short of producing a swamp: being often the neglected cause of what are popularly called sickly seasons, in certain districts of England, as might easily be proved by a reference to facts in great number.

Whatever revolutions in the production of Malaria, whether as to its absolute generation, its increase, diminution, or disappearance, may occur from alterations in lakes, whether these consist in their increase, diminution, or drainage, they will be so easily explained from the general principles, that it is unnecessary to dwell on them. If it would be abundantly easy to adduce specific facts in proof, from foreign countries, it cannot be necessary: but I may quote one instance among ourselves, of the complete extirpation of Malaria by the drainage of a very small piece of water: and it is worth quoting, as equally proving a then almost unsuspected cause and its remedy. This was the North loch of Edinburgh; formerly noted for producing agues, which, since the drainage of that spot, have disappeared. And even the insignificance of this spot renders it a valuable example, as proving how very small a body of water is [illegible] permanent source of the disorders of this nature, even in a climate so little favourable to the production of Malaria as is that of Edinburgh. They who know what the North loch was, must be incredulous indeed, if they do not admit that what occurred there, must be common every where; and it would be somewhat difficult indeed, even from this sole evidence, to point out the pool in England which should not be a cause of fevers.

There is little doubt that the state of the Malaria in the neighbourhood of the great American lakes, is undergoing changes from the alterations that take place along their shores; but there are no observations as yet on which we can rely as to the fact itself, or at least I have inquired for such information in vain. And if I may put an eventual case, it is easy to see that when, at some future, if far distant day, the fall of Niagara shall have ceased to exist, from the wearing backwards of the bed of the river to its own lake, such an entire revolution will take place throughout this whole chain, as cannot fail to be attended with marked consequences as to their Malaria, be those results what they may.

It is much more easy to ascertain the alterations in the production of Malaria which arise from that vacillation in the extent of lakes dependent on the changes of summer and winter; most conspicuous in those which, like our Whittlesea mere, are formed in flat lands. Unquestionably, the heat of summer itself would increase the production, though the size of the water should remain unaltered; but there is a great accession to the evil produced by the tracts of marshy land which are laid bare by its recession, as well as from the exposure of the muddy bottom, as formerly discussed. This effect takes place most unquestionably in Switzerland, and much more notedly in Italy; while, in Sicily, among other spots, the Lake Biviere, suffering a loss of two-thirds of its dimensions in summer, is a conspicuous example; as is the lake or pool at Cagliari in Sardinia, where the fevers, thus produced, are noted among the most notorious in the Mediterranean. It appears also to be true of the Caspian sea; and to an enormous extent, along the whole of its expanded shores; but, what must interest us more, it is a very palpable result of the diminution in summer, of our own smaller ponds and pools, the poisonous qualities of which were formerly noticed.

And this also may explain, perhaps entirely, what has hitherto appeared obscure respecting the disorders generated by the Malaria of these narrow spots, and the seasons in which they are active; while by examining those particulars more closely, I shall, to what I formerly said, add further proof that they are causes of disease, however that may be doubted or denied. If they do not so often produce disorders in spring as in autumn, or if, causing ordinary fevers, they do not give rise to intermittents, it is not solely from the differences of season, or heat, but from differences in their relative conditions at those seasons; while thus also it is, that they more rarely generate simple and original intermittent, as this is chiefly a disorder of spring. And I think this point so important, from the immense number of these minute spots of water which are found all over England, and from the utter ignorance or want of suspicion respecting them, that I must be excused for urging it; particularly, because, in many places, and in the neighbourhood of London especially, it is usual to leave such pools in excavating for gravel, even on the populous commons in its vicinity: diseases being thus sometimes brought among a population where they were formerly unknown. But if no ague is generated, or if at least this is rare, and if the consequences are hence denied, the solution is easy. In the spring, these pools are commonly full to the very margin; while, very generally, the steep gravelly banks exclude any vegetation, as the depth of the water, or other causes, prevents also the growth of aquatic plants. But as summer advances, the water subsides, a vegetation encroaches on the borders, the purely aquatic vegetables begin to flourish and die, and, in the autumn, these spots are so many petty marshes; often also exposing muddy shores or bottoms to the action of the sun, and then producing the fevers which are attributed to the heat of the weather, to fruit, or to any other cause but that which is the real one; and which might often be prevented or remedied by a different management, such as to prevent the lodgment of water: a proceeding which ought to be rendered a regulation of the police, by every parish at least where such operations are permitted.

In speaking of marshes, I was compelled to notice the increase of Malaria produced by inundations of the sea and of rivers; and I might then have added, that the alluvial plains traversed by rivers, although they should be otherwise not unhealthy, are frequently rendered so by that common operation, the transference of the stre
or the formation of new channels. The effe
this is, in fact, to produce swamps and poo

ground before dry; changing them also, in successive seasons, or after new alterations of the stream, from one point to another; and with injurious consequences far too notorious as to the Asiatic and American rivers at least, to admit of doubt.

This is a very frequent occurrence in particular, along the course of the Ganges and the Burhampooter; and, in Bengal, it is in reality one of the principal sources of the fevers which are so often the cause of extensive epidemic mortality in that country. I have here pointed out casual inundations, leaving consequent pools or marshy spots, as being here, and elsewhere, an ordinary and almost an annual cause of disease; but this permanent change of channel is also one of great extent and importance; the deserted reaches becoming lakes or pools, which are filled by the rainy season, to be again laid dry; and which, at length, as vegetation begins to accumulate in them, form marshes, or swamps, and jungles, of the same character, and perhaps even more pestilential.

Of the consequences arising from simple inundation, Egypt, as already remarked, produces a familiar example, since its season of fevers commences with the subsidence of the Nile; and thus also, at Bassorah, the same effects, and to a highly destructive degree, are produced after the overflowings of the Euphrates. This, or the letting loose the river, it is related, is a common mode of revenge on the inhabitants of that town, adopted by the Arabs; while it is said that, on one occasion, 14,000 people perished in consequence. In Italy, from a similar cause, or, by the breaking loose of the Foglia in 1708, a bad epidemic was the consequence at Pesaro; and the same events have frequently followed the inundations of the Rhone, at Villeneuve St. George, Avignon, and elsewhere, as has also happened in Normandy, in the commune of the Greverie, from the inundation of the Vire. Similar occurrences are related of Silesia; nor should I here forget that a noted and destructive fever was the consequence at Rome, from an inundation of the Tiber, in 1695. With respect to the Danube and the Don, the facts and the results are far more common, and infinitely more notorious; but I might, without difficulty, extend to any length, a class of illustrations which it cannot be necessary to pursue further.

But there is a class of phenomena belonging to rivers, so intricate in its nature, and so important in its consequences, as to require a more minute notice; while it concerns all countries, and our own among others, much as it is, like all else, overlooked or unsuspected. The state of things to which I here allude is also a steady cause of the progressive increase of Malaria; affecting almost every river of the world, and further, proceeding, as to the whole globe, in an accelerating ratio, so as to lead to a constant augmentation and extension of diseases, unless where it is counteracted by other causes, natural or artificial. If, as relates to the Thames, I have reserved a notice of this fact for the next chapter, I cannot avoid speaking of it here, belonging, as it especially does, to the matters under review.

Every river which, by bringing down materials from the mountains and propelling the sea, has formed flat tracts of land, such as the great plain of Bengal, or those of the Oroonoko, and the Mississipi, with thousands more of less note and on all scales of dimension, must sometimes rise above its ordinary banks, causing inundations. Thus, when incommoding the adjoining lands in agricultural countries, it is embanked by art; while, in consequence of this process, the alluvial matters which would be dispersed over large spaces, from those changes of direction whence the plains themselves are formed, become confined to the channel itself; deposited within a narrow space on its bottom. Thus they tend to raise the water in its bed, and, consequently, to cause it, on any increase, to overflow, still more certainly, the lands around. And as this effect is the very consequence of the embankment, so, at any given point, the bank must be made to keep pace with the rise of the channel, that the restraint may be effectual and constant. Hence as the river becomes more elevated, the ultimate result is the same as if the surrounding lands had been depressed to the same amount: and thus, while the stream which drained them once can drain them no longer, they become, first, meadows, and ultimately marshes. And if, in the former condition, they can still be drained by means of canals and floodgates, this process becomes in time inefficient, and recourse must be had, as in Holland, to lifting machinery.

Now, as the same process take place at every point along the course of the river, the embankment must also be extended further upwards towards its source; or, while there is a necessity for elevating the former bank every where, so a new one becomes required where there was none before. Thus, the including lands which did not formerly demand any drainage begin to require it; or that which was dry land becomes meadow, the meadow becomes a marsh, and the marsh a swamp or a pool. And thus, throughout the whole process, does disease increase. The new land, as formed by nature, will be a focus of fevers: and hence a constant augmentation and extension of disease throughout the world, proportioned to the formation of new lands, whether naturally wet or rendered so by embankment.

Such is the analysis of this particular cause of the revolutions of Malaria, a revolution of augmentation but too commonly; while, if the examples would be abundantly easy to produce, their very numbers render that unnecessary. But, reversely, insalubrious tracts of land may be rendered healthy, or the production of Malaria is diminished, by natural changes in the courses of rivers; and in different modes. It may chance, for example, that the breaking loose of a river may inundate a tract of marshy land, or convert into an innoxious lake that which was a poisonous swamp; since, to inundate, by whatever means, provided the operation be effectual, is to destroy the very sources of the poison. In another, and in the opposite mode, it is easy to conceive how a change in the channel of a river may lead to the drainage of a marshy tract: but there is one case of melioration, in the instance of rivers, which is progressive, as it is also extensive; operating over the entire world, and counteracting that very increase of disease from the formation of alluvial lands, which I have just been describing. If the first effect of the deposition of alluvia, is to form a marsh where the river meets the sea or a lake, and if such tracts are gradually extended by the same operations, the successive deposition of new alluvia, while it may push forward a further marsh, raises that which was last formed, or converts the marsh into a meadow, and, successively, the meadow into dry land; the remedy thus going hand in hand with the evil. Thus it also often happens, under favourable circumstances in the declivity of the shore, that no further marsh is formed, or the remedy becomes complete. And hence if, in some places, there may be a progressive augmentation of disease through ages, there are, in others, progressive amendments, or an entire removal of that source of pestilence which had once existed. Thus we learn to explain the revolutions for the better which have occurred with regard to the popular health in certain situations in our own country, in France, and perhaps more distinctly in Italy, the fertile parent of examples in every thing which belongs to the natural history of Malaria.

Such geological changes are the chief causes of those revolutions in the public health which, from the testimonies of history, have occurred, since the classical times, in Italy, and probably in Greece; of which I have had occasion to allude to some, in different parts of this essay. Fundamental, at least, they are; whatever other causes, of an agricultural nature chiefly, may conspire with them, or whatever art may have effected in diminishing the produce of Malaria, or, unintentionally, in augmenting it. And that they have scarcely ever met the attention which they deserve, in either case, is most apparent in all that has been written on this subject; while we must often be surprised at the modern neglect of what seemed to have been most accurately studied by even the remoter ancients. It is further plain, that in many cases where rivers are concerned, the sea must also be an agent in the production of all such revolutions. It is by a joint action of the sea and the river where the meeting occurs, that the alluvia are distributed; and that distribution may be such as to produce either evil results or good ones. In the lagunes of Venice, as I have elsewhere remarked, the effect is good; or the sea carries off the alluvia which would otherwise form banks of pestiferous mud: in the Pontine marshes, it appears to be the reverse; but amid so many complicated effects as must occur in all these cases, it would be tedious to describe all that does or may happen at the collision of rivers with the sea.

But even without the aid of rivers, revolutions in the produce of Malaria take place in many countries, from casual events, or from that change of the mutual level of the sea and land, which geology ascribes to the subsidence or elevation of the latter; an alteration of level which appears to be connected with the cause of earthquakes, and which has, on various occasions, operated so conspicuously in Italy, in both directions, and in some cases, in both alternately, as at Ravenna and near Naples. How marshy land might thus be laid dry, or dry land be rendered marshy, is sufficiently apparent; while both these effects have, at different times, occurred at the very place which I have named, Ravenna, as in other parts of the Adriatic, and on the Mediterranean shore of Africa; having, doubtless, been attended by changes in the salubrity of those districts.

That casual irruptions of the sea have produced revolutions of the same nature, both for good and for evil, and on several conspicuous occasions, is well known. In these cases, the inundation has either extirpated disease by covering a marsh, or has excited it by rendering dry land marshy; while, reversely, the retirement of the sea, has also, from acting in different ways, produced both the effects in question. Holland, and the shores of the Baltic in general, can produce historical testimonies in abundance as to these points; while epidemic seasons of dreadful celebrity, and even of perennial continuance, have often arisen from such inundations. Our own Lincolnshire will furnish other examples; and, doubtless, could we know the truth at present, the loss of the Goodwin lands by inundation proved the remedy, expensive as it was, for a wide tract of poisonous marsh. That the Persian gulf also produces examples of the same nature, and to a terrific extent, appears from the writings of many travellers; if the specific facts have not been accurately distinguished.

Of seasons of mortal epidemics, produced by eruptions of the sea, Calabria, under its earthquakes, furnishes examples even more notorious than Holland and Denmark; and the minor changes to which I have been alluding, will probably explain most of the apparent mysteries which relate to the history of the revolutions of Malaria on sea shores; among others, the unexampled present condition of Civita Vecchia, that of Carthagena in Spain, and those of several places at the mouths of the Rhone, so different in point of salubrity now, from what they were in the times of the Romans; changes which, in some cases, as combined with greater facility or new modes of propagation, have often extended their influence very widely.

There is yet one fact connected with those revolutions in which the sea is concerned, which has often been of great efficacy, though more frequently in diminishing than increasing the production of Malaria. This is the sand inundation, conspicuous on the shores of the Baltic and in Holland, as well as in Italy and France, and on the African shore, and sufficiently remarkable in many places in our own island. By this, marsh land is not only raised, but covered and dried; and thus have many poisonous tracts been remedied in the countries which I have named. That, in some situations however, the sand flood has produced evil instead of good, is most certain; by forming external bulwarks, and thus retaining the land water in the form of marshes or lakes: an event of which our own country presents many examples, though on a small scale.

If I recollect aright what I have not seen for many years, it would be easy to comprehend the nature and action of many of these circumstances, as far as the sea is concerned, by an inspection of the connected shores of Sussex and Kent, which I select as an example out of many others, because it is well known. A geologist at least, would have no difficulty in seeing, here, where a pernicious surface has been produced and where it has been remedied; and how both these effects have resulted at different points, from similar or opposed operations, or how that very change which has amended one spot has disordered another. Hence, in practice, have arisen those alterations in the salubrity of many of the situations on the English coasts, sometimes for good and sometimes for evil, which are well known to the residents, if they are seldom able to account for them, and therefore often view them as of a mysterious nature.

I may now proceed to remark, that to remove a Malaria by inundating land which cannot be drained, will always be a very compound question; and if I cannot just now quote a case of such an experiment, either successful or otherwise, it is a proposal which has long been debated in Dominica, respecting that flat tract of mangrove in Prince Rupert's Bay, which is the demonstrated cause of the frequent and severe mortalities of this ill chosen spot. How obviously necessary it is that in such an operation, the inundation, whether by means of fresh water or of the sea, should be accurate and steady, I need not say; since it is plain that an ineffectual operation might aggravate the evil which it was intended to remedy.

The last of the revolutions of Malaria, as to increase or decrease, depending on alterations in the soil, is that which belongs to woods; but it is a question which chiefly concerns the intertropical or hot climates. The principle of judgment in this case is as easy as in any other, from considering the causes of the Malaria. The woods which produce it in those climates, are the close and marshy forests or jungles; and as these can scarcely be affected but by destruction, it is only by eradicating or burning them that the diseases which they produce are extirpated. Thus it is, that as the increase of population produces this consequence in all woody countries, the natural effect of clearing the ground for cultivation, is often also the cause of the diminution or extirpation of fevers; while I have formerly shown how the very reverse effect sometimes takes place. If other reasons, sufficiently easy to judge of, conspire, this is at least a fundamental cause of the improvement of the health of the people in new countries. Thus also is it, reversely, that when, in consequence of famine, destructive wars, impolicy, or bad government, agriculture and population diminish, the diseases of such climates increase, even in an excelling ratio, from this cause among others; as the vigour of vegetation soon restricts the once opened soil, to restore it to somewhat like its original state of thickets and forests and neglect. It is not poverty and famine alone which are the causes of the increase of disease in these cases, though such is the explanation commonly given and received. The rude land gradually encroaches on the cultivated: if pasture succeeds to agriculture as a more manageable economy, if drainage or embankment is neglected, if rivers break loose and marshes replace what was meadow, so do forests and thickets and jungles rise and spread, and as man becomes weaker, nature becomes more powerful; reclaiming her rights, and bringing calamity and disease upon neglect and poverty. We have but to look at the Turkish states to see how truly this is the picture of the country which that ignorant and stupid government rules, if rule it can be called, but to destroy.

The remedies, in this particular case, often concern us, as colonists, most seriously; and they are easily deduced from the general principles. To destroy such forests and woods where they exist, to prevent them from increasing, and to do all this by occupying the ground in another manner, form the remedy and the prevention both; while, fortunately, it is a remedy which in general amply repays its expence, in the augmentation of useful produce and population. It is true that there are cases, even in our own possessions, where this is impracticable, from mechanical or local and physical difficulties, no less than from the irrepressible vigour of vegetation, and, further, from the useless or inapplicable nature of the fundamental soil, as well as from deficiency of population, or want of demand for the produce. But there are some, in which we must perhaps blame the policy or the councils of our colonial governments, for neglect of what they might sometimes remedy with very little difficulty.

For India and its councils there is however an ample excuse as to this subject, great as are the evils produced by its uncleared lands; while there appears no want of conviction as to the extent and nature of the evil or its cause, or as to the only remedy. The magnitude of the evil could not possibly, in fact, have been overlooked; having been almost the destruction of armies, and sometimes more exterminating than all the collision of actual war. The difficulty, it must be admitted, is considerable, if it is not absolutely insuperable; as it consists in no less than determining that obscure and most complicated question under our supreme government, namely, where the real title to the lands lies. The destruction of jungles, and, with that, the diminution of fevers, with the consequent augmentation of agriculture, may be but partial motives, perhaps, to an investigation and settlement which shall set this point at rest; but, added to all the other inconveniences which attend this unsettled condition of property, they may be expected to assist in stimulating the councils of India to an effectual exertion, whenever an opportunity, not probably to be commanded, shall occur. But to terminate a subject which, by means of local references, might be converted into a volume, I may now add, that whatever other revolutions may occur in the influence of Malaria, they are dependent on its propagation rather than on its production, and will therefore be deduced, without any formal enumeration, from the statements forming the next chapter.

CHAPTER VII.

On the propagation of Malaria.

To ascertain all the circumstances under which Malaria is generated, is most obviously the essential part of every philosophical inquiry into this subject; and while, as it is here, in its very germs, that it may most effectually be checked or eradicated, this also is the question which chiefly concerns the people or their governments. But the propagation of Malaria occupies at least the place of next importance in the philosophy of this subject; while, though often far less under our regulation or controul, we are not absolutely powerless in protecting ourselves from the diseases of which it is the cause, by diverting or impeding it. To know the remedies, it is first however necessary to make ourselves acquainted with the facts; to investigate all the means by which, and the circumstances under which, it is propagated.

Here too I must regret that a deficiency of information disables me from giving that regular analysis and detail of those circumstances, without which philosophy ought never to be satisfied. The observations of any individual on such a subject must be narrow, and my own have been peculiarly impeded; while in seeking for information, whether published or oral, there is so little of fact to be extracted from mountains of rubbish, and so many obscurities and contradictions after all this is done, that, when the labour is gone through, the whole is little better than a tract intersected by wide chasms, or a collection of fragments. Hereafter, it must be hoped that whatever is here defective will lead to that truth, the arrival of which was never yet accelerated by conjecture or confident falsity; or by those plausible expressions and terms, which too often pass for ideas.

Whatever Malaria may be in its simple state, it is only as united to the atmosphere that we know it; and we must therefore view it as an aeriform fluid, as far as the question of its propagation is concerned. It must indeed be considered as the very atmosphere itself, where it exists; and its propagation therefore must be primarily regulated by those laws which govern the motions of currents of air.

Here, unfortunately, occurs our first and fundamental difficulty; for we know nothing, in reality, of those laws. The theory of the winds is one great obscurity; the limited, internal, and less remarkable motions of the air, are, if possible, a subject of still greater darkness. Thus it is that we can predict little respecting the propagation of Malaria through the agency of currents of air, and are compelled to judge locally by local observations, or by experience which we cannot transfer to other localities. But as this substance, whether gasiform or not in its origin, is probably a compound, whether mixed with the air, or dissolved in it, or in some state of chemical combination, it must be subject to chemical laws as well as to those mechanical ones which regulate the motions of aeriform fluids.

And though the chemical constitution of atmospheric air is constant, as far as we at present know, the atmosphere itself is a variable substance; since, to its three radical elements, is added water, varying in quantity, and probably also in the condition which it holds as to the essential ingredients. And, since the matter of Malaria is united to this variable fluid, that union may be more perfect, or more abundant in one condition of the air than another, while there may also be conditions in which it will not combine at all. Thus also may that union be affected by variations of temperature; while we can further conceive it capable of being decomposed or destroyed by actions, however unknown their nature is to us, connected with certain conditions of the atmosphere.

Thus the propagation of Malaria from its generating source, may be influenced by variations dependent on these causes; it may be produced in abundance, but the existing atmosphere may be incapable of absorbing, or of conveying it, or else it may be destroyed by the union; and hence our expectations may be disappointed when we reason solely on its mechanical propagation. And it is probable, by analogy, that this is true; while the evidences from fact, will find their place shortly. Thus, certain states of the atmosphere, independent of motion, and therefore probably chemical, are found to dissolve and communicate contagion better than others; while there are also conditions in which it seems to die, or is not propagated at all. Thus it is, also, familiarly, with regard to odours; and very notedly with the odour of flowers, and with that general vegetable perfume which fills the atmosphere of spring and early summer.

I have said that Malaria was probably a compound substance; an inference drawn from the mode of its production, and from its analogy to contagion; and the compound nature of this latter substance, is proved by the facility with which it is destroyed or decomposed under new chemical agencies. This is not so well demonstrated respecting Malaria; that is, by direct chemical experiment; but the fact can scarcely admit of doubt, when we know that it never penetrates certain atmospheres which are impure or charged with foreign ingredients; as will be pointed out hereafter. We can scarcely therefore err in assuming the chemical destruction of Malaria as a law concerned in the phenomena belonging to its propagation.

But there is yet a fact concerned with this, which appears indisputable, though our knowledge of the nature of Malaria does not enable us to give its theory. This is, that it is capable of being attached to certain solid substances; to vegetables for example, and, possibly, to the soil itself. I use the word attachment rather than union, though even that term is perhaps too strong; but whatever the relation be, it seems to possess an analogy to the case of the matters of contagion, in which an absolute and durable union takes place with many solid bodies, as if they were themselves solidified in the substances. The difference however in these two cases is, practically, of great importance; as there is no evidence that the matter of Malaria is thus durably attachable and transferable, any more than that it is regenerated through the medium of a diseased body, as contagions are. Were the plague indeed the produce of a vegetable Malaria, as has been supposed by some persons, then would one of its varieties at least be as attachable as contagion; while it would also be reproduceable by the animal actions. Were any remitting or marsh fever, decidedly originating in Malaria, capable of similar reproduction and transference, as has been said, this would form a material addition to the object of this inquiry; but whatever the controversies may have been on this question, the opinion has not been established; while it is a dispute appertaining to the medical portion of this work.

The way seems now cleared, as far as it can be at present, for examining into the facts which relate to the propagation of Malaria; and the first, as the simplest case, is that of proximity. The place in which it is produced, or that which is nearest, ought to suffer most from its action; it being also presumed that the atmosphere is at rest. And that this is the fact, with some exceptions to be hereafter noticed, consists with all experience. Hence it is that residence on or near a marsh is injurious or hazardous; while, in the case of more narrow spots, it is probable that such absolute contact or immediate vicinity may even be necessary to the action of the poison, since a small distance may render its power null by dilution. And it is both reasonable and consistent with experience, to measure the danger, whether as to effect, or power of propagation, by some ratio derived from the magnitude of the pernicious soil, or the quantity of Malaria generated.

If the general experience of all countries confirms this view of the danger of proximity, it is strikingly proved by the practice of Italy in former times; attentive to this subject as it appears to have been, even from the earlier periods of the Roman power. Hence it is, that so many of its ancient towns are situated on hills; while, in spite of the opposite practice in the foundation and growth of Rome, it is evident, from the Roman statistical writers, as I have shown, that they were fully aware of the evil, and of the value of this remedy.

It ought to be superfluous, to ground upon this simple fact, cautions or advice respecting the choice of places, whether for towns, or houses, or encampments; yet we see that this has been overlooked or despised, in uncountable instances; not only in former times but in recent ones, in our very days, and in all countries. If ignorance may often be permitted to excuse itself for the original error, there are abundant cases where there is no excuse for having continued to build and remained to die, through generations. Rome perhaps became too gigantic during its period of ignorance, to be afterwards abandoned or transferred: but there was no apparent reason for perpetuating Calcutta, when, from the very hour almost, of its foundation by Charnock, its destructive situation had been demonstrated. That Holland should have persisted in inhabiting that Batavia which it had studied to render even more poisonous than nature had already done, by the model of its own pestiferous fatherland, is a problem which Holland must be allowed to explain as it best can.

It must be presumed that ignorance, as often as convenience, will also be the defence of Spain respecting the Havannah, Vera Cruz, and so many more of its American settlements; where, in some cases at least, death seems to have been courted, and where a little thought at first, or a little resolution and sacrifice afterwards, would often have avoided the evil. Thus also may

France defend its ancient towns of Nantes, Rennes, Dol, and many more in the north, with others in the central and southern parts, beyond numbering; by the plea of ignorance added to that of necessity; while, for Holland, throughout, necessity is a paramount plea. But the example and the knowledge of Italy were open to the whole world; and as little was medical and statistical information in such a condition as to have admitted any excuse for St. Lucie and New Orleans; as for endless other settlements, equally ill chosen, in almost every European colony and conquest throughout the world.

But not to extend examples of this nature, it must be admitted that convenience and necessity often produce strong pleas in favour of a bad choice, or of a persistence in the original bad choice of the enemy whose ground has been occupied. Situations of this pernicious nature are often the most fertile and the most populous, they are often convenient maritime posts or seaports, and they are often the strongest and the most defensible places. But there is often also a choice, without losing all these advantages or encountering all those evils; while, unfortunately, it has seldom appeared as if the uncertainty of human life and the quantity of human suffering ought to enter into the political calculation. Yet even on the views of public economy, this is a question deserving of consideration. Human happiness is, after all, the end and object of all this conquest and commerce; and in acting thus, we surrender the object of pursuit in pursuing it. Nor is the security of life less necessary to profitable industry, than security of property; while, in this case, the legislating founder of a colony professes to ensure by direct laws, what he destroys by the very roots. And thus also does it follow that, on security of life, depend, mainly, morality and good conduct; since, in human history, it is a noted truth, that the maxim " let us eat and drink for to-morrow we die," becomes, in such Batavian situations, the too common rule of a loose life. Were it necessary to prove our own neglect on this subject, I might quote, what I now may with safety, Prince of Wales's island; but I am more pleased to pass from such questions.

If I have here dispersed the remarks on the remedial processes against Malaria, by bringing them into juxta-position with the particular circumstances to which they are applicable, it was that I might avoid the repetition which must have followed the allotment of a separate chapter to them; though producing thereby, inconveniencies, I hope, of less weight. And I must therefore introduce here a few further remarks on this subject as it relates to military proceedings; though I must divest them of much of their authority, by suppressing whatever, as belonging in particular to recent facts, might give pain to some one. The bare suspicion of intending censure should be avoided, where the sole object has been, by means of facts which ought to be considered as mere evidences, to inculcate useful knowledge and prevent further evils. It is impossible to say what will be right without observing what has been wrong; to correct error without pointing out error, to produce evidence without examples. Had there been nothing to blame, this essay would never have been written; for there would have been nothing to teach.

It is a general observation which applies to all cases as well as the present, that in addition to the evils which Nature herself has inflicted on us, in the production of Malaria through unavoidable causes, man is too often accessary to his own miseries as arising from this great source of disease, through his ignorance; not unfrequently also, through his carelessness, his fatalism, his cupidity, his malgovernment, his vices, or, what is more excusable, his poverty. Planting wood or cutting it down, clearing lands or suffering them to lie waste, turning the courses of rivers or neglecting them, embanking or neglecting to embank, digging canals and ponds for use or ornament, in these and many other things, nations and people have often been their own greatest enemies; not seldom from ignorance or inattention: while from introducing particular kinds of cultivation, from the improper choice of places for towns, or houses, or military defences, and in far more, we may find instances of the consequences of all the leading causes of the evils in question. On many of these points it is the business of governments and of education to enlighten where they cannot direct or interfere: where military operations are concerned, the state has but to order and be obeyed; taking care that its agents are enlightened, wherever it must trust. If it has not always watched as it ought, it is only by hearing of its errors that it will learn to do what it has neglected.

In addition to what I have here said respecting the injudicious choice of seats for towns or colonies, by all governments, and of much more which it would be long to detail, and in addition also to the careless or injudicious mode in which naval services are often performed on the shores of tropical and insalubrious climates, I cannot, before attending to what is merely military, avoid a remark on the mode in which it has so frequently been attempted to penetrate Africa. The dangers of the interior investigation, arising from the tropical fevers, are sufficiently great already; while, to these, have been added, in almost every instance, the sometimes greater, and generally unnecessary ones incurred from entering the country by the avenues of the great rivers, which are, above all, the most destructive seats of this pestilence. Thus have expeditions been defeated by the deaths of the travellers, even at the outset; forming an accumulation of evil, of which the facts are familiar. I know not why this plan has not been abandoned; when in addition to what ought to be obvious to any one acquainted with Africa, the comparative success of the attempts by way of the desert, has demonstrated the superior advantages and security of this route. I need scarcely point out, in addition, the very obvious oversight or obstinacy of attempting effectually to explore this most pestiferous country by means of unseasoned or unhabituated Europeans; while it is not very easy to discover why this could not be done by the aid of negroes or natives educated for that purpose; when so many individuals of these races have given ample proofs of their capacities, as well as of the possibility of attaching them permanently to European interests.

But, as to public matters, it is chiefly in military service that the ravages made by the diseases of Malaria have been frequent, serious, and often ruinous; while if those have sometimes been inevitable, they have much too often been the results of neglect, or of what should be called ignorance, were it not that there is in reality no ignorance on this subject in the age, whatever there may be in the individuals directing or executing. Lancisi, Sennert, Orlandi, Platner, De Baumes, Zimmermann, Pringle, Lind, Blane, Jackson, hundreds more, writers without number and writings without measure, have explained this subject, if not always very philosophically, yet at least as to the useful or necessary details, sufficiently; leaving no excuse, since those who can do no more, may at least read and follow. Nor is even experience wanting, and in abundance, nor living examples of knowledge and caution on these points: and still it would seem, as if fated, that the wisdom and experience of one generation should be forgotten by the next, that peace should extirpate the knowledge that had been acquired in war, and that what is possessed by enlightened individuals should never spread so as to illuminate the public mind.

How far the great practical errors committed on this point have been the consequence of oversight in the education of those who, in any country, direct and command, and how far they have flowed from a deficient and faulty medical education, wheresoever established, are questions which it would not be very proper, nor very agreeable, to discuss in this place; but be the causes what they may, the weighty and serious importance of all that is connected with such neglect, cannot be too often nor too strongly urged. To despise, habitually, dangers to which we are not ourselves exposed, is natural, as it is easy; but it is too late to change the smile of superciliousness to repentance, when the destruction of armies, or perhaps the loss of battles or of campaigns, has been the result. Were the mortalities caused in armies by disease, the consequence of this neglect or ignorance, to be placed in comparative array with those produced by the pure casualties of warfare, the account would present an aspect, perhaps little suspected, even by statesmen: whether or not it would produce those effects as to the future which it has seldom yet done in the past.

Examples might be accumulated without end, and the history would be a fearful one. It is said that 10,000 men were lost by Walcheren: how far the campaign itself was lost through the same cause, it is not needful to ask. It is now a less painful as well as a less offensive case, to tell, that when the French army attempted Naples in 1528, they were reduced within a few days, from 28,000 to 4000 men, by choosing an injudicious encampment at Baiæ. Similar, and from a similar cause, was the great mortality in Hungary in 1566. There were excuses in 1528 and 1566, which did not exist afterwards, and least of all in the last war; yet all European wars, ever since, can furnish examples in abundance of the same nature, from the ignorant or careless choice of encampments, as from other modes of ignorance and neglect, even to the selection of pestiferous situations for permanent barracks. It was a fortunate discovery in fortification that a dry ditch was more defensible than a wet one; since the safety and efficiency of a garrison seem never to have entered the minds, even of the Vaubans, the Coehoorns, and the Cormontaignes; though far more intimate, it must be supposed, with Malaria than ourselves.

It is much to be wished, that, not only on the subject of war, but in every case of ordinary life, it could once be impressed on the minds of the people, and of their governments, of all those whom it may in any way concern, that the diseases of this nature, that the mortality of war by sickness, are really not a necessary part of the order of things; not unavoidable mischances to be placed in the calculation of events, not the irrepressible course of nature; but that they are the produce of our own ignorance, our own neglect, or our own prejudices. That which is esteemed unavoidable, is suffered without remonstrance, almost without regret: it is Fate, it is held irremediable, and it is not remedied. It is perhaps calculated that 10,000 men can effect the service desired; but it is calculated also that the half must die of sickness: 20,000 are appointed. Thus is endured what is expected; but let it once be believed that it is not fated, not unavoidable, and means will be taken to avoid it. Man does not want exertion, and as little does he want talents, would he but employ and cultivate them; but, indolent in both, he sits down and consoles himself with believing that thus it was destined.

And if, from want of knowledge, so has similarly destructive conduct been adopted in spite of it; in opposition to information and caution, and even to experience and demonstration. If the supercilious contempt with which Malaria is often viewed, has often been dearly paid for, even by individuals, still more bitterly have the " Achivi" suffered from that of their rulers. It was not the case of our army indeed; but when nearly a whole regiment was not only incapacitated at Malta in one night, and with the loss also of great numbers, but rendered nearly useless through the whole war, by persisting in occupying a village which the natives had abandoned, and against the most pressing remonstrances, it was a case which that army could have spared. And similarly, three or four times, and by means of as many successive parties, was it determined to occupy as a Telegraph a rocky point in Sicily between Rasaculmo and Spadafora, though thirty men were successively destroyed by that Malaria against which the natives had warned the commanding officer. And thus was a similar obstinacy on the part of the French, during one of their early occupations of Corsica, punished by the successive and not less rapid extermination of every garrison, for a long period, by which they attempted to hold San Fiorenzo.

Thus also was our hospital at Port Mahon fixed on the precise spot where it received the whole Malaria of that pernicious valley, pestiferous during four months of the year; while by choosing the elevation of Cape Mola, at its north-eastern margin, these bad effects would have been entirely avoided. And the truth must be told; that, whether in this case or any others, the medical staff was not sufficiently consulted or empowered, and therefore blameless, this was not the fact every where nor always; since, at the commencement at least of those services, it evinced the same contempt of Malaria, (a contempt which in reality was ignorance,) as the military itself did, and as was displayed by all our early travellers in Italy. Nor could a stronger proof of that be given, than from the whole history of Walcheren; in the details as in the original arrangements and project; since little selection was made even as to the sites of the hospitals, which were, on the contrary, often chosen in the very worst places of this pestiferous island. And lest exclusive blame should here appear to be thrown on ourselves, it was in consequence of

Orloff's choice of cantonments at Naussa, in Paros, itself one of the most pestilential spots of all Greece, that this army was nearly destroyed, and the objects of that campaign frustrated.

And when I make use of the word contempt, I state a fact perfectly known to our naval and military officers, at least at the commencement of our wars in the Mediterranean, and indeed long after: a contempt and an incredulity respecting Malaria, to which thousands of lives were sacrificed. And if there are hundreds who have lived to believe in what they once despised, purchasing their conviction however at a severe price, many have paid the forfeit of their ignorance and pride with their lives. Nor have I stated what, even respecting our travellers in Italy, is not known to every Italian; to the very people as to persons of education; cautioning in vain, those, upon whom, truly English in all their opinions, caution and advice were thrown away. They too have at length begun to concede and to learn; but for those who are now less confident in their own omniscience, their predecessors have paid the dear ransom of their lives, and not in small numbers. It has been well said at Rome, that none but dogs and Englishmen walk in the heat of the day; and it might have been added, that no one but an Englishman sneers at Malaria, though, as on other occasions, often suffering deeply under his imagined superiority. It is scarcely credible that all this should have been, and, doubtless, that it will all be again; that human life has been thus sacrificed, by thousands, almost by millions; and where knowledge did exist and was attainable. But perhaps it is fated that man's obstinacy should effect that which nature might not so easily attain through any other road; while the very slender specimens which I have given, scarcely implying a life in ten thousand, may enable a reader to conjecture what, on this point alone, must have been the history of war, even of modern war.

But I must not make this a book of anecdotes; while I wish, if possible, to impress on the minds of all those whom it may especially concern, the necessity of studies which they cannot omit if they would do their duties, and of investigations and attention without which the duties of a commanding officer or a quarter-master general cannot be properly executed in any climate, far least in a hot one. To say that it is the duty of the medical staff, may be abstractedly true; but, in practice, or in the field, it appears not to have been so considered; while the accidents to which

I have alluded seem to prove, either that this staff is not sufficiently consulted, or has not sufficient power; since I must not suppose that it is ever deficient either in knowledge or attention. That the fault has existed, is most certain; and that, somewhere, blame must alight; where that should fall, it is for others to determine.

Be this as it may, a military commander must at least desire to know the nature of the duties entrusted to those whom he commands; while with respect to this particular subject, though its end be medical, or rather, appertaining to sanitary measures, it is one which is at least as attainable, by a military man as a merely medical one; since it implies that knowledge of ground so indispensible in strategy, which a very slight addition of discernment respecting pernicious soils would render perfect as to the objects in question.

If any additional inducement can be offered for these ends, I wish it could be impressed on the minds of military men, as of every one concerned with hot climates, that when they are terrified with the very name of the plague, and are thus led to adopt precautions which certainly cannot be too rigidly followed, they forget that the plague is actually as nothing in the scale of mortality, when compared to the diseases of Malaria; to the fevers, the dysenteries, and the choleras of the tropical regions, and to all those endless consequences which disable those whom they do not absolutely destroy. Yet such is the weight of one name compared to another; while the precautions against such diseases, as universal and perennial as the visitations of plague are confined and rare, are very widely within our power.

To detail these precautions, and to apply them to every military case which may occur, would be again to traverse the ground already passed. I can but refer, as before, to general principles; but I will terminate this episodical discussion with a case that illustrates a principle as to precautions, which, in certain countries, it will often be essential to recollect.

In this instance, an army was encamped in a very pestiferous plain; yet the health of the men did not suffer, because, being near the shore, the sea breezes, predominating at that season, swept back the Malaria into the interior country. From some cause, the encampment was transferred to another point, without recollecting that the change of the regular winds was approaching. They did commence, sweeping in a new direction across the plain; and, within a few days, many thousand men were disabled or killed. How a better calculation respecting the periodical or regular winds would have saved this catastrophe, is sufficiently obvious; while, even after it had commenced, it appears to have been forgotten that this fine army might have found shelter from the disease, by the mere transference of the camp to a spot beneath a neighbouring hill, and without surrendering the military advantages of the position. If this, comparatively trifling catastrophe, injurious to the service as it really was, might, as the result of inattention or ignorance, have been avoided, it is not possible to reflect, without deep regret, that it ought not to have happened, and not easy to avoid some warmth in endeavouring to show how such evils may be in future prevented.

To proceed to some cases of a different nature, the same neglect is found on a smaller scale, in the choice of situations for dwelling houses; and if, to the term neglect I were to add obstinacy, it would be but a truth: the obstinacy of ignorance which cannot learn, or of conceit that will not. It is sufficient if I here apply this remark to our own country; because, although I could illustrate it by abundant instances, everywhere, it is England that chiefly concerns an English writer writing to his countrymen. What

I formerly remarked respecting unsuspected sources of Malaria is here applicable to houses, and even to houses on the highest scale of opulence, in numerous places; while, if ignorance has here been a valid excuse, it ought not to be such any longer. Nothing surely can be more fundamentally necessary respecting the choice of a site than that it should be salubrious, or at least free from absolute causes of disease, whether as a question of happiness or one of economy, since it involves both. But as it is unnecessary to dwell on this subject, I shall pass on to another cause intimately connected with that which I have been discussing, as being a modification of proximity.

The cause to which I allude may be called condensation; and if it has not been well studied or described, it is one which can be borne out by facts, as it might be anticipated to exist in certain circumstances. Or, it is easy to suppose, that while the production of Malaria is gradual and constant, it must accumulate, unless decomposed by chemical actions or dissipated by the winds; while, from the distances to which it is frequently carried, we have no reason to suppose that it is often or easily decomposed in the common atmosphere. Thus might we anticipate that a marsh confined within the walls of a forest, as in the pine swamps of America, or the marshy ground of a jungle, or even our own moist woods, should accumulate Malaria in unusual quantity, and therefore in unusual virulence; and this seems to be established by the most ample experience in numerous places. Thus also might it be supposed that a similar soil, inclosed within high hills, or occupying a valley little susceptible of ventilation, should be peculiarly insalubrious; and this is proved by experience, though, from deficiences in the philosophy of Malaria, the cause has been often overlooked where the effect was known; producing some of the usual imaginary mysteries as to this poison.

If in the former way, we can perhaps explain the peculiar virulence of jungles and pine swamps, and even of woods, everywhere, thus also we can probably account for the activity of Malaria in many well known parts of France, Germany, Spain, and Italy, where its diseases prevail with peculiar activity and virulence; while the condensation, arising from want of ventilation, is often the result of a screen or enclosure of trees, if sometimes also dependent on the form of a valley. In the former case, the remedy is pointed out; while, fortunately, it is a practicable one, because of that power over trees which is denied us in almost every other case of the imprisonment of Malaria. To detail the means, is unnecessary. The object is, ventilation; and circumstances must determine how this is most easily and effectually to be obtained. And, on this ground, we may see why it is, partly, that the clearing of new countries often exterminates or diminishes the diseases of Malaria, though there are cases, as I have already shown, where this is the very cause of its production. It is not only that the soil is dried by exposure to the sun, that a formal drainage is established, or that the cultivation of innoxious plants succeeds to that of an injurious vegetation, but that the poison which was formerly concentrated, is diluted or dispersed by the winds. How nearly this general rule may be applied to our own country residences, where uniting stagnant or still waters to the confinement of a woody lawn, it is quite superfluous to say. Those who cannot profit by general principles, but who must, at every minute, have the application made for them, are not of a capacity to profit by any thing.

If our information about Acapulco is sufficiently precise, it is an instance of the imprisonment of Malaria by hills; since it produces all the consequent diseases, while it is the valley that can scarcely be ventilated. And if I am at a loss for other remote instances of this case, from the difficulty of discovering philosophical truth among the herd of travellers, St. Lucie seems to offer an example of a similar nature, as do many of the vallies, somewhat unsuspectedly, in the higher parts of Caucasus, by the testimony of Klaproth. That Italy and Greece abound in such cases as this, renders it unnecessary to specify the localities: while many of the ill ventilated vallies of Switzerland produce striking examples of the same nature, noted by travellers of even the most superficial observation.

Having said all that appears necessary on the condensation of Malaria, I must proceed to inquire respecting its migration or dispersion; an intricate, and often an apparently mysterious subject. In this case, we are compelled to resort much more to facts, than to theoretical reasonings respecting what ought to be, because of our ignorance respecting the motions of the atmosphere and the laws by which they are governed. It is true indeed, that, in a popular sense, we know whether the wind blows from the east or the west; but, regulating ourselves by horizontal vanes, and by the movements of vessels on a similar plane, we have formed the inveterate habit of concluding that every wind must be horizontal, and that it must move in a straight line. Facts which it would be out of place to enumerate here, prove, not only that all this is fanciful or hypothetical, but that while the currents of the atmosphere are irregular and intricate in the greatest degree, they, further, scarcely in any instance obey the common law of rarefaction or unequal density by which they are supposed to be produced and regulated.

If we cannot therefore explain how a current of Malaria may be directed or limited, no motion can occur in one, so unexpected or unreasonable, as not to find its solution in the capricious and intricate currents of the atmosphere. If currents move vertically upwards, so may Malaria; if in the reverse vertical, the Malaria may descend; while both these are facts ascertained. If its course is curvilinear, there are curvilinear winds enough to justify it; and thus of almost every caprice, in its propagation from this cause, which can be imagined.

To proceed to cases or facts, since to these we must come; although, among those to be enumerated, there are many which must depend on other causes than merely intricate currents in the atmosphere, whatever difficulty there may be in explaining them.

The most common case requiring explanation, and which, if not to be explained in this manner, must remain at present without a solution, is that where a spot of marshy ground produces disease at some distance, even more remarkably than near at hand, or than in its very inhabitants, or where, as sometimes happens, these escape altogether. It is a case of some importance, as extending the degree and range of insecurity, and consequently, as calling for precautions that might not have been suspected to be necessary.

Numerous instances of this nature have been pointed out by different writers, but a few will serve to establish the fact: while, however desirable it might be to notice all those which have been ascertained, at least in our own country, since this is one of the insidious cases as little suspected as it is generally disbelieved, such an enumeration implies a length of detail which must be left to a geography of the Malaria of England.

In Italy, it has been ascertained that the poisonous exhalations of the Lake Agnano reach as far as the convent of Camaldoli, situated on a high hill at the distance of three miles: this instance further proving that, thus far at least, Malaria can be conveyed by the winds. In France, at Neuville les Dames, above Chatillon on the Indre, and at St. Paul near Villars, both situated on high grounds, there are found as many or more fevers than in the marshes beneath where the Malaria is produced, and the same is generally true all through Bresse in the Lyonnais. Thus also the plain of Trappes near Versailles is affected by the marshes of St. Cyr, though considerably elevated above them.

I am also informed that a case of this nature occurs in Malta, of a very marked nature; the Malaria which is produced on the beach beneath a cliff, producing no effect on the spot itself, while it affects, even to occasional abandonment, the village situated above. Many more similar instances might be collected; but I must be content with adding a few from our own country coming under my own observation, and sufficiently well known to be easily verified.

At Weymouth, where the back-water, as it is called, produces intermittents, and also autumnal fevers, commonly mistaken for typhus, these diseases scarcely affect the immediate inhabitants of its vicinity, but are found to range along the high grounds above; and the same, in Cornwall, is true of the vicinity of St. Austle, receiving its Malaria from the marshes of St. Blaisey. If I am not misinformed, it is equally true of the marsh of Marazion in the same county.

The marshes about Erith in Kent, also, are less injurious to the inhabitants of the lower grounds near them than might be expected; while their effect on the houses which are situated high on the hill above, is such as, at different times, to have been very severely felt by the inhabitants. The same is true of Northfleet, if my information is correct; or, the fact as stated is, that at some distance, on the high ridge so well known, agues are more prevalent than below and near the point of the production of the Malaria. If this is not to be explained by the flow of a current, so directed as to escape the low grounds beneath these cliffs and declivities, while it ranges across the hills in contact, I have no solution to offer. I suspect that a similar caprice occurs between the low grounds about the river Lee and the higher lands that bound its valley; but am not sufficiently certain of the purity of the facts to do more than point it out as a subject for inquiry; as I must also leave to others to apply this rule, such as it here appears, to whatever difficulties of a similar nature they may chance to discover.

But I will add one statement, extracted from Captain Smyth's valuable statistical table of Sicily, because it appears to generalize the whole of these facts; leading to the conclusion, that, nearly in an equal number of cases, the higher grounds suffer as much as the lower; the locally healthy as those which are the very seats of the Malaria. In this document, out of seventy-six unhealthy towns and villages enumerated, there are thirty-five situated on hills or declivities; while, from his personal information, I may add that many of them are at considerable distances from the tracts which produce the disease. And I may add one remark as to the theory of this propagation, derived from a writer on the climate of Italy. It is, that the southern winds in that country, propagate along the hills, upwards, that Malaria which the northern or mountain ones do not; such winds, independently of their superior power in producing the pernicious exhalations, tending, from their temperature, to ascend the acclivities, while the colder winds, as is easily understood, have the opposite inclination.

I have nothing more to add admitting of any similar simplicity of explanation; but we can now see how we may attempt to account for the particular transference of Malaria in certain directions, by attending to the actual direction or the probable currents of the winds that pass their generating spots. And while we thus explain many apparent anomalies, so we can discover remedies for some particular cases, and further, account for certain vacillations in the apparent production, though actually in the effect of Malaria, from changes not depending on season or on the other causes already or hereafter to be enumerated.

If I just noticed the case of Acapulco, as a probable one of the condensation of Malaria, while, doubtless, many decided ones could be found in Italy, though I have not been fortunate enough to discover such in the authors whom I have consulted, it is not difficult to find examples of the effect of vallies in conducting and directing the Malaria. And whatever difficulty there may be in explaining the exact cause by which it is conducted to a spot distant from its origin, and in some determinate direction, in cases such as that of Northfleet, where it must ascend through an unconfined air to traverse the summits of open ridges or hills, there is no difficulty in comprehending how it may be conveyed to a distance through prolonged vallies; since, in such cases, it does but follow the course of the narrow stream of wind in which it exists. Thus it would be easy to conceive, before experience, that if the plains about Fort William in Scotland could produce a Malaria, that this valley was situated in Senegal for example, a southerly or westerly wind might, and probably would, carry it on to Inverness, or, reversing the marsh, in the reverse direction; and from experience this is ascertained to occur in similar situations in many places. Of these, one example may suffice, and it is from Ceylon. If that valley has a name, it has escaped me, though the fact has not; and this is, that whenever the sea wind blows in such a direction as to cross the swamps on the shore and enter the valley, it conducts it many miles inland, so as to produce the fever where at all other times it is unknown; and with such decision and promptitude as to have attracted, long since, the attention even of the natives, not likely to be extremely observant on such subjects.

But in Italy, analogous remarks, if under different modifications, are almost universal. Among other things, it is a leading observation that, on the southern shores, the wider the mouth of the valley opens to the sea, or to the influence of the south winds, and the less deeply it penetrates the country among the mountains, it is the more unhealthy; as, under this form, it cannot receive those northern or tramontane winds by which it would be swept, while, reversely, the southern breeze is checked and accumulated in its progress inwards, condensing or retaining the pernicious vapours which its heat also tends to generate more especially. In Sicily, and also in Greece, it is no less observed, and very universally, that vallies not only confine but conduct the Malaria; this being a very conspicuous fact in the latter country, in many narrow vallies which open to the sea and thus conduct the breeze inland, through pernicious tracts, to places not essentially unhealthy. Similar modifications of ground productive of the same results, are also pointed out in Italy, as elsewhere; but I need not prolong remarks, of which the chief value is, that, in the latter cases at least, they indicate the obvious remedy, often of very easy application: that being to plant screens of trees across such vallies, so as to intercept the current; while I need scarcely repeat that a similar remedy, applicable to the first cases, is precisely that which the Romans seem to have employed in ancient times on the shores of Latium.

The case of trees presents one of much more intricacy, and also of far greater importance. It involves, as has already been indicated, the production, or otherwise, of Malaria, as well as its condensation and its propagation in various ways; while it is also one of the most important cases as far as soils or localities are concerned, since, whether for good or evil, it is that which is the most frequently, sometimes indeed almost completely in our power.

For example, since the creation of an obstacle to the winds, as in the planting or natural growth of woods, may either increase the effects of a Malaria by confining it, or remove or diminish them by cutting off a communication or diverting a former course, so may the destruction of the obstacle which a forest interposes to a particular current of air, introduce a Malaria to some particular spot where it was before unknown; as different and opposite changes of this nature may produce those revolutions, for increase or abatement, production or disappearance, of disease, which have so often been represented as of a mysterious nature; such ignorance also having occasionally been made rather a matter of boast than shame, as if it was the ignorance of all respecting a difficult subject, instead of an unpardonable want of discernment on the part of the individual.

Not to recur to what relates to the actual production of Malaria from the cutting down of forests and the breaking up or exposure of such land, nor to the reverse case, where the planting of a wood becomes a remedy, by its absorbing the moisture of a soil or by screening it from the sun, nor to repeat what has been said on the condensation or confinement of this poison by trees or forests, the district of Bresse in the Lyonnais, among many more in France and some few in Italy, offers, at present, examples, not only of such condensation and its effects, but of both the opposing effects as these relate to propagation; namely, of their power in preventing its access, as screens, and in checking its progress so as to accumulate it in a place which it would otherwise have passed over; and further, of directing it in lines which it would not else have followed, and to points which it would not have invaded. To limit myself to a few well known cases from Italy; a convent at St. Stephano became unhealthy in consequence of cutting down some trees; and the extirpation of a wood brought on severe fevers at Velletri during a space of three years, as also happened at Campo Salino in the Pontine marshes.

It would not be difficult to quote instances in support of this general proposition and these several effects, from the histories of our colonization also, and from those of our permanent campaigns; but while it would also be abundantly easy for me to render almost the whole of this portion of the work an amusing and somewhat interesting collection of facts, rather than an abstraction from these for the purpose of establishing certain general principles, two evil consequences would follow; that of injuriously increasing the bulk of such an essay as is designed to be popular, should that prove its good fortune, and that of diverting the attention of superficial or ignorant readers from what is important to what is entertaining. Philosophical minds may indeed keep their eye on the beacon which guides them through such a wilderness; but it is always the fate of others, in such cases, to lose sight of the true path while they pursue the flowers and butterflies which are thrown in their way.

And, not to accumulate examples with which pages might be filled on the whole of this interesting part of the question under review, it ought now to be superfluous, and would assuredly be tedious, to point out the nature of the remedial processes in any cases of this kind where the fault may be suspected to arise from trees, under any mode, or to be capable of extirpation by the management of forests. It is evident that nothing but an accurate study of the localities, and also of the previous history of such tracts, can point out the necessary steps as to any one place; and that this is a case requiring intimate knowledge of the subject in general, together with that eye for ground and general philosophical discernment which belongs to the practised and philosophical engineer. The general principles are, now, not difficult of apprehension; but their application must be trusted to those who are capable of applying them to particulars.

But it will not be useless, while it may be interesting, to quote one noted instance, in which it appears that the removal of trees has actually produced very injurious consequences; and where the case is that of Rome, the space which it may occupy will be pardoned. I say, appears, because I find by experience that it is almost impossible to rely implicitly on any testimony, since an assertion on one side is not uncommonly counteracted by some contradiction on another. Under this reservation, I shall immediately show, what indeed is far too well-known a fact, that the influence of Malaria through Rome has been graeastward; while it may be suspected here, that as far as this occurrence is new, as it is asserted to be, the immediate cause must be sought in the extirpation of the mass of wood just mentioned, which formerly sheltered this quarter of the city from that wind which crossed the pestiferous plain.

From this point it is said now to reach to a certain distance along the Corso, the banks of the Tiber, and the west side of the Pincian hill; continuing its course along the base of that elevation, by the church of the Trinitá del Monte, and thus round the foot of the Quirinal and Viminal hills, to the church of Santa Maria maggiore. In its further progress it reaches the church of San Pietro in Vincoli, diverging towards the Campo Vaccino, and proceeding onwards to the eastward of the Colosseum. It is also further said to have begun to enter, but at a later date, by the quarter of the Porta maggiore and that of San Giovanni; occupying at present, to a severe degree, the district of St. John Lateran, and holding its course over the Coelian hill towards the church of St. Gregory, where it spreads to the eastward of the Palatine, towards the ancient seat of the great Velabrum and the river.

To omit minuter and further details, I may also add, that by reports more recent than those from which the preceding sketch was drawn, its progress is by no means finished; and that every year adds something to the extent of its course and influence, and not a little to the alarm of the inhabitants; since, should it proceed for many more years in the same accelerating ratio, Rome, the eternal city, may perhaps at length be abandoned, and the modern Babylon as it has been named, become, like Babylon the great, a desert of ruins.

In what respect this state of things may depend on an increased production of Malaria in the surrounding Campagna, or whether, under other winds, any portion of this evil arises from an increased insalubrity of the Pontine marshes or the southern lands in general, I can discover no facts from travellers or in writers to enable me to form a judgment; nor, at present, any other local cause but that just named, and which relates to a greater facility as to the progress, not the production, of this destructive atmosphere. But as far as regards that slowness of pace by which it creeps along the streets of Rome, while it is probable that the direction is governed by that to which the currents of the winds are determined, it is equally probable that the gradual gain which it makes on one point after another, is further regulated, and, in reality, caused, by the diminution of the population, and by the very fact that the people retire before it. I shall soon show how the poison of Malaria is destroyed by the circumstances which attend a crowded street; and while in this diminishing city, house after house is abandoned, it is plain that new means are afforded to it for another step and a further progress; the general fact being further confirmed by its following those lines and attacking those places, especially, which are most denuded of inhabitants. Hence it is a misplaced surprise which wonders why the Villa Borghese, or other elevated situations exposed to a free air, should be almost uninhabitable; since it is this very freedom of the air which is the source of all the evil.

One conclusion of much importance follows from this view, if it be the true explanation which I conceive it to be: and it relates to futurity as that may be connected with the political prosperity of Rome. If it is true that ancient Rome suffered less from Malaria than the modern city has generally done and than the present one does, and if the surrounding lands were not less poisonous then than they are at present, or indeed under any view of their comparative condition, the very fact of a more dense population in former times may explain the difference, as I have here suggested, and shall more fully demonstrate shortly. Thus, all external causes being the same, or even should they now be different, the increasing effect of this pestilence must still go on to increase, in an accelerating ratio with the commercial or political feebleness of the state, and its consequent diminution of industry and population: and very especially, as to the upper classes, with that increase of poverty which has led them to abandon their expensive palaces, and thus, from a still wider influence of depopulation around those, which I need not explain, to give freer admission to that plague, which, once established, can never be encountered or braved again. And if it be true, as is said, that the Malaria has now reached the Vatican, it is easy to see that the alarm which may desert it in consequence, will soon render a lasting desertion inevitable.

Thus will that process of degradation which attends all states placed in the circumstances in which Rome now stands, operate with increased and accelerated energy, by the aid of this ally, disease; and should the progress of this not be suspended, should it proceed as it has lately done, depopulation itself will proceed in a ratio which mathematicians would almost call geometrical, and hasten with rapid steps, a catastrophe in which the whole civilized world will partake with that city which is almost the common property of learning, art, and science, wherever existing.

As I can preserve little order in what follows, I may now point out some facts of a singular kind, which, if they belong to the propagation of Malaria, are also, in some cases, connected perhaps with restraint and condensation, and further possibly with diversion; while the last must be referred to that obscure circumstance, the attachment of this substance to solids, which was formerly mentioned.

In Rome, it is pointed out, in more places than one, that the Malaria, which must there be transported, not generated, will occupy, even with some permanence, and in some instances also, perennially, one side of a garden or a street, while the opposite one remains exempt. If, in some cases, this is connected with that singular propagation just described, it is an explanation that will not solve every case of the difficulty. They who know Rome, and its tales on that subject, will remember the opposed churches where the porter or janitor on the one side, long and invariably suffering from fever, was cured by the mere transference of his office to the opposite side of the same street; and where, at the same time, the duty had been always as safe as it was invariably dangerous or destructive on the other. This is a circumstance indeed of very frequent occurrence in various parts of Italy, but I will only quote one more instance from that country, out of many, because it is well known to many officers then serving with our army in Sicily. The village, the name of which has escaped me, unless that be Faro, was situated above the Faro of Messina; and while one side of the street was in the highest degree pestiferous, producing mortal fevers among the troops, the opposed one was entirely exempt.

Whatever apparent mystery there may be in these occurrences, and though perhaps the same explanation will not apply to every case, there are some common facts in meteorology which will probably help to explain some of the instances in question. It is probable, as I have shewn in another place, that the matter of Malaria is often connected with vapour, or mist; conducted by it, and probably defined, as to its place and extent, by this, its vehicle. Now as, in the case of dews, or more particularly in that of hoar frosts, we often find this occupying a certain extent, both superficially and as to level, reaching for example to a particular hedge in some valley, and then ceasing by a most definite and sudden line, while also terminating at a particular altitude on the trunks or branches of trees, as if suddenly cut off, it is not difficult to imagine how a Malaria thus united, might be as defined and as local as it is actually found to be in these singular cases. Of causes depending on the direction of winds, it is not also difficult to imagine more than one modification: since the poisonous spot might lie in its peculiar current, or, otherwise, be a place sheltering a substance which, as I shall presently shew, seems occasionally to subside and rest, as if it possessed a specific gravity greater than that of the surrounding atmosphere.

A domestic instance of the same nature is perhaps even more worthy of notice, from the great extent of range through which this remarkable fact occurs, no less than from the accuracy with which the limits of the Malaria are defined; while this case is even the more remarkable, as being an example of transportation and not of production. For the truth of the fact itself I have the testimony of the country at large, as well as that of some individuals of accurate habits; while whoever is inclined to doubt, may find the means of investigating it without difficulty.

This is the high road between Chatham and Feversham, involving an extent of about twenty miles; and it is here remarked by the inhabitants, that in every village and town, including also the detached houses, and comprising, from Chatham, Raynham, Newington, Sittingbourne, Bapchild, and Boughton, the ague occurs, on the left hand side of the road, generally, and is unknown on the right side; though the breadth of the road itself forms the only line of separation. If I were to repeat, in addition, some special facts, believed and related by the inhabitants of some of these places, and at Sittingbourne among others, this separation is even more wonderfully and mysteriously precise than the general fact as thus stated would prove it to be. I need only add, that the lands producing this Malaria are situated generally at about a mile distant, on the left hand, being as well known as the road itself.

I do not pretend to explain the almost marvellous singularity of this particular instance; while it would, in reality, be far more convenient to disbelieve it, as is the not unusual practice of philophers in similar cases. But I cannot doubt what so many agree in asserting; while, as in not a few other difficult cases of unexplained facts, it is not easy to comprehend the nature of the imagination which could invent such a tale, nor the courage which should persevere in asserting an untruth so easily detected. And to disbelieve, merely because we cannot explain, is more convenient to ignorance and vanity, than it is either philosophical or modest; as it is the not uncommon proof of both: while I presume I need not say, that philosophy is as little likely hereafter to profit by sceptics of this nature, as it has hitherto done. Modern research has proved that many things, once incredible, are true; since, even in science, the "vrai" is not always the "vraisemblable": but such discoveries have not been made by those whose vanity rejected as false what they did not understand: and never will. That guns which had been reposing for a century at the bottom of a deep sea, were red hot when brought up to the light of day, was as little believed and as much ridiculed, as the limitations of the Malaria in this case will probably be by the sceptics in question: yet the investigations of the same credulous person proved its truth, and added a new and interesting fact to chemical science.

If this remarkable instance does not seem to be amenable to any of the solutions which I have just suggested, if it cannot be brought under any rule dependent on the direction of winds or aught else, since the boundary line is so vague a limit, and so variable as regards any causes which we might imagine possible ones, it is not so widely removed from the case of Faro, and from some of those occurring in Rome, as to be an absolutely solitary difficulty. Under some laws, it must be: and, as far as these cases accord, those laws must be general ones, while they must be either chemical, or meteorologically mechanical. We are in ignorance; that is all: but at some future day, they will be known; though not till the entire subject has been studied on those philosophical principles which have never yet been applied to it.

I must yet add one remark before proceeding to the next class of analogous phenomena; because it really seems to be demanded, not in this particular case only, but with respect to the whole subject very widely. Of these last facts,the partial course, limitation, and definition of Malaria, there can be no possible doubt; so numerous are the cases, every where, and so often have they been not merely described, but proved by the most ample experience. Yet there are none which have met with more ridicule, not to say opposition merely, in our own country, by those who affect to treat with doubt or contempt the whole of this subject; among whom, I grieve to think that there should be any in the profession of physic. Claims to superiority, if this be one, are better proved by knowledge than by the want of it: and opinions of this nature, worthless at all times, are much misapplied where human life, as well as suffering, is so deeply concerned. It will be abundant time to controvert what is erroneous, when the disorders which have been so long misunderstood shall be better distinguished, and when we shall have learned to prevent them by removing their causes.

The caprices of Malaria with regard to level, are often among those the least easily explained: though in certain cases, the solution is sufficiently obvious. There appeared no great difficulty, as long as it seemed an invariable rule in Italy, where this extreme partiality of transmission or existence was first remarked, that the Malaria lay near the ground, and was transmitted in the direction of a stratum near its level, in preference to a higher one. Thus it was found safe to sleep in the second or upper story of a house, while the fever seized on those who lay below; and thence certain well-known practices also in that country, relating to the closing and opening of windows. The fact indeed is sufficiently common, elsewhere: and if it required confirmation, Dr. Hunter will inform us, that in the Spanish town barracks in Jamaica, where the barrack consisted of two floors, three cases of fever occurred in the lower story for one in the upper.

The solution here seems easy, and perhaps it is also the true one. It is, that the Malaria is especially united with that transferable substance which forms the foggy stratum; or that the lowest portion of the atmosphere in the act of depositing water, is its vehicle and its residence. And this solution, while it agrees with the popular opinion respecting low mists, as it does with a great variety of facts relating to the conduct of Malaria, noted on various occasions throughout this essay, is apparently connected also with one particular fact which will soon come under review. The only apparent difficulty lies in an analogous, but somewhat jarring circumstance which has come under my notice, by means of information which, being unconnected with any theory or any knowledge of this circumstance, or of the subject in general, being in fact a mere popular observation from experience, can scarcely fail to be correct. This is, that on the coast of Norfolk, in some places where Malaria prevails, it selects preferably the second or upper story, while the lower one as invariably escapes. Both facts may however be equally explicable on the general principles already examined; as, in the last case, the direction may be that of a local current of air, determined by circumstances which would probably be discovered on inspection. In any view, these different facts are worth detailing, on account of their practical utility; as leading to precautions which might otherwise be overlooked.

Whether the specific gravity of the poisonous gas itself which constitutes Malaria, or that of the air which, as a peculiar modification of the atmosphere, forms its most convenient vehicle or repository, is connected with these phenomena, is a question yet to be investigated. But there are other facts which seem to prove that it can be lodged and retained, even where it has not been produced; though whether from possessing a greater weight than that of the surrounding atmosphere, or because sheltered from that movement of circulation which is unceasing, in all open places, even where there is no sensible wind, is the point to be examined. To name a striking case of this nature, I may refer to Valetta, alluded to on a former occasion, on account of the consequences which almost invariably occurred in the Floriana guard, while other parts were little affected, or retained their health. Here, the ditch was very deep and narrow, but so perfectly dry that it could not be suspected of producing the Malaria to which the effects in question were owing. Nor could this be explained, except by supposing that it lodged and protected from dissipation, a current of noxious air, produced from that salt marsh which seems to be the source of Malaria in Valetta, and which the sea breeze directed on to this spot. Nor is this explanation improbable, either for this case or other similar ones, when we know that carbonic acid, as well as watery vapour, or a moist atmosphere, can thus remain at rest on the ground, or in any other place where it is protected from the general circulation of the atmosphere, for a great length of time.

That I may keep the chemical question which relates to the propagation of Malaria by itself, I shall here notice the facts that bear on its attachment to solid substances.

In the Campagna of Rome, it is remarked that if the labourers cut down certain plants, (a bushy thistle, chiefly, of which the botanical character has escaped me,) a fever, that would otherwise not have occurred, is the consequence. The Malaria seems, or is thought, to be entangled within it and to be let loose by this disturbance. That there is any analogous fact ascertained in our own country or elsewhere, I know not; but if it be the truth which is asserted, it is probable that the cutting down of reeds in our own marshes may be the incurring of a hazard that might not be encountered on merely passing through such lands. In a subject on which we are yet so imperfectly informed, it is at least deserving of further attention and inquiry, and therefore it is worth recording.

Further, it is a common remark in many parts of Italy, that as long as the labourers are in the erect posture, they incur little danger, but that the fever attacks those who sit down or lie on the ground, as if the poisonous matter extended to but a small altitude above it. Whether, in this case, the cause be, as in the former, an attachment of the Malaria to the ground itself, or to its vegetation, or whether it is that it is a part of a ponderous stratum of air lying on the ground, as carbonic acid does in the Solfatara, is a question which requires investigation, at least as far as philosophy is concerned; but whatever be the cause, this also is a fact worth recording, because it may be a general, if a neglected one, and may exist, with pernicious and overlooked results, in our own country.

In such cases as this, from the far inferior virulence of the poison with us, the result might be a very slight fever, or at most an ordinary one; while, as such an event would most frequently occur during the time of harvest, it would naturally be attributed to heat or fatigue, or to the influence of the sun; and might thus, under peculiar symptoms, as it most unquestionably often has, be even considered a phrenitis. These false judgments, and their pernicious consequences as to the practice, are but problematical examples possibly (though I cannot help thinking them often real ones) of the mischief arising from ignorance as to this cause of fevers, and from the assignment of imaginary ones; and if I have, in the medical portion of this work, noticed the palsies produced in the same manner, the probability of this being the real cause, is also confirmed by what happens in the pernicious districts of Italy under the same carelessness. If, in the Maremma of Tuscany and elsewhere, it is generally a dangerous fever which seizes the incautious labourer, so, very often, is it apoplexy or palsy; while, as I have had occasion to remark in another place, immediate death is often the consequence there of lying down on the ground; the labourers being frequently discovered dead, when supposed to be asleep, by the way sides or in the fields.

Unaware of any thing further of any importance that bears on these cases, I may now inquire how far the propagation of Malaria, or its action on the body, which cannot here be easily separated from that, depends on chemical conditions of the atmosphere. This is a question in which we have no guides but analogy and detached facts; since, as long as we continue ignorant, both of the nature of Malaria and of that of its union with the atmosphere, we can derive no aid from theoretical views.

If not rigidly a gaseous matter, it must be such, or nearly such, in its union with the air; and, not improbably, the conditions necessary for that union, must resemble those which rule bodies that enter into a similar combination. If therefore, odoriferous substances be allowed to present an analogy, it should be most easily united with a moist atmosphere, and most easily diffusible through such an one. And further, it seems tolerably well proved, that the matters of contagion also are most easily diffused through a similar atmosphere, and that, in a dry one, they are difficultly propagated, or altogether destroyed. And as the analogy here seems more perfect, we might conclude that a moist atmosphere was really favourable to this process as it relates to Malaria; or that, in this condition of the air, the diseases which it produces are most easily propagated. In how far a moist air is favourable to the production of the poison, is a question difficult to disengage from this one in a practical view; but as it falls under the subject of season and climate, it will inevitably recur hereafter.

In this case, before noticing what may seem to confirm the theory, I must interpose a medical remark, which, if it is a fact, may affect some of the conclusions on this subject. This is, that the body is rendered more susceptible of such diseases by the influence of a moist atmosphere. Thus does physic pronounce; but it assuredly has not been demonstrated. It may possibly be so; but if it cannot be proved by something more than the readier appearance of the diseases of Malaria, it may be utterly unfounded; while the easier propagation of the poison itself, will account for the phenomena, and render that solution unnecessary. That it has been adopted as an hypothesis to explain a fact, because a better explanation was not at hand, seems probable.

As to the facts which confirm the opinion that Malaria is peculiarly propagated by a moist atmosphere, they are perhaps not very definite, but they are numerous and various; the variety, in this case, atoning in some degree for the want of a more perfect demonstration from one fact. If, among numerous circumstances, there is always one steady cause present, it is probable that this is the cause sought for.

Now, it is not only a popular observation that Malaria is especially conducted by common fogs, but an observation so rooted, as to have led to the very universal error among the people, of supposing the fog itself to be the very poison and the cause of disease. Nor is it merely a popular observation; as a wide experience of a much more accurate kind, shows that it is a fact on which we may repose without hesitation. If the fogs of Holland are proverbial, the truth seems to be the same in our own country, in America, and elsewhere; as it appears to be equally true of the intertropical climates, where the mists and fogs have a character so different; being commonly distinguished by their heat, as our own are by their coldness.

And as connected with this question, it cannot be irrelevant to remark, that the intermixture of Malaria seems to be the real cause of the pernicious nature of fogs; allowing for some exceptions or modifications arising from the action of cold and moisture, or heat and moisture, which medical readers will easily supply. If it were not so, the same diseases which the pernicious fogs of fenny countries produce, should occur in elevated or mountainous situations subject to be involved in clouds, since the cloud is, in every other respect, a fog. If it were not so, the fogs of dry countries should produce the same diseases as those of moist ones, which they do not; and if it were not so, the westerly fogs that so often arrive in our island from the Atlantic, should generate the diseases of Malaria, like the easterly ones arriving from Holland or formed on our own fenny coasts, which they are never known to do. And to confirm this, it is remarked, that while, in Flanders, (in Artois,) it is the south-westerly and southerly winds which bring and spread disease, in consequence, obviously, of the lands which they traverse, as well as of their own conducting qualities, it disappears as soon as the sea wind from the northern quarters sets in, although this is accompanied by dense and durable fogs. And the same rule will be found to hold good in many parts of the Mediterranean, as well as in France, in numerous cases.

The next fact in support of this view, is analogous, yet somewhat different; while it is also a popular observation, and not less a matter of more accurate medical evidence. In our own climate, it relates to the pernicious nature of the morning and evening mists formed on low grounds; and, in the hotter climates, I need scarcely say that the effect of such mists in generating fever, is as notorious as any fact the best established upon this subject. And while, in these cases, the progress of the sun upwards in the morning is the remedy for the morning mists, as the day altogether is for those of night, this fact also seems to confirm and illustrate the same opinion, namely, that the watery or moist atmosphere is the active conductor or repository of the Malaria, and that when the former is dissipated, the latter is checked in its progress, possibly indeed in its production; entirely dispersed, or, it may even be, destroyed. This also explains the no less common error respecting the cause of the poisonous effects of dew in hot climates, since this is obviously also a case of the propagation, possibly also of the production, of Malaria. It is not the dew itself which is the poison, but the fever-generating gas which is united to the watery atmosphere whence it is precipitated.

If this also explains the influence of night, generally, in propagating Malaria or producing its diseases, so does that well known fact, in return, confirm the general theory in question. How truly night, no less than morning and evening, is the time of danger from this cause, is too well proved by the experience of Italy to need any other proof: though everywhere, and in every way, it is among the most received and best proved of the facts belonging to Malaria and its diseases.

Thus also is it especially remarked, that if a hot day is succeeded by a cold and damp night, the effects of Malaria are much augmented; and the same analogy holds as to similar changes in seasons, or as to incidental ones occurring in any manner. Hence if cold and wet weather should unexpectedly take place in the midst of a hot summer, an augmentation of severity, or a state of disease before not in existence, will occur; and hence also severe epidemics occur particularly, if, to such a hot summer there should succeed a cold and rainy autumn; the production of the poison, as I formerly remarked, being apparently augmented in this manner, while the atmosphere is also rendered a better conductor. The general philosophy applicable to all these cases, is, that watery vapour, or a moist atmosphere, is the best solvent and conductor of Malaria, as a dry one is the worst; while independently of the different effects of those two states on vegetation and on putrefaction, it is the effect of the sun to evaporate or disperse, possibly in a great measure to decompose, that gaseous matter, which is condensed, and probably very often again precipitated, during the evening, together with the vapours which had been held in solution in the air.

It is from the same cause partly, that arise the notorious effects of the rainy season in the tropical climates: the general reasoning being the same, while I need not dwell on the particulars in these most violent cases; the more, that I have been so often obliged to allude to them for different purposes. And if such consequences occur even where there are no marshes, it is, obviously, as I have remarked elsewhere, because the very soil becomes virtually a marsh under such rains and amid such a vegetation. When physicians therefore, arguing as Park seems thoughtlessly to have done, attribute the production of fever, or of Malaria, to the rain alone, or to a moist atmosphere, attempting further to confirm this theory by saying, as Lind has done, that even in England, a rainy season will produce remittents and intermittents, and in the healthiest districts, or where Malaria is unknown, it is that they have overlooked all the obscurer places and causes which it has here been my endeavour to point out; thus throwing a very considerable, and also a very dangerous, confusion into this plain subject.

Let me here subjoin one remark as to the effect of night, which I ought not to reserve; though I am not satisfied of its value and truth, seeing that there are contradictions on this subject. It is Italian experience however; and all that I can do is to collate it with other Italian experience, allowing the reader to strike the balance which I cannot. The assertion is, that however Malaria should be present in any given spot, there is no hazard after nine or ten o'clock at night, or that its influence belongs to evening rather than to proper night. It is conceived, of course, here, that as it is entangled in the morning vapour, becoming dissipated or destroyed as the sun approaches the meridian, so when the condensation of the evening mists has been completed, it is precipitated and rendered inert or null. All that I can say is, that it is quite possible both assertions should be true, in different places and in different seasons; as it is easy to conceive how the meteorological operations connected with vapour and dew, may vary in their duration, or in their relative periods of commencement and termination. As a question of practice, for the convenience of those who may be under the necessity of exposing themselves at night, the knowledge of these variations in the propagation or influence of Malaria may be useful; though they must be ascertained for each place, by trial.

I had thought that such general remarks, be the country Africa or Italy, might have been applied by any one to our own cases and our own island; that I might have saved myself the perpetual trouble of applying every fact and every rule to England, that what I had explained of the Malaria of other lands, or of the subject in general, would have been sufficient to enable any one to make the inferences desired; or, that if an Italian fish-pond, a Flemish ravelin, or a Dutch ditch, was pestilential, so might ditches, fish ponds, and fortifications be judged pernicious among ourselves. Experience has taught me the contrary: Malaria is indeed an Italian word; but I know not that Miasma would have served the purpose better. Let me therefore illustrate, for ourselves, this last set of facts.

It is said, and believed indeed, that the night air is unwholesome. True, it is so, but not necessarily or not always; otherwise at least than as mere cold may be injurious; while the effects of that, such as they are, are well understood. It is thought unwholesome because it is cold, or because it is damp: these are the reasons assigned; but the philosophy is false or confused, and thus the rule of avoidance becomes an inconvenience without being a precaution; while as an inconvenience, it is for ever broken. It is broken also when this air is not damp and not cold, because the philosophy is erroneous: and hence danger and disease which real knowledge would have prevented. No one fears a summer evening, even a mild summer night, unless indeed he shall find or fear a dew. Yet here lies the very danger; in a land of meadows and parks and ponds and rivers and woods, a thousand times more hazardous than all the nights of all the winters that ever were. This is the real night air to be feared, even though the grey mist should not rise, as it is called, or the dew not fall. To take a pleasant evening walk by the banks of the river or the lake, to watch the trout rise from the fish-pond or the canal at the evening flies, to attend the milking of the cows in the green meadow, to saunter among wet groves till the moon rises, listening to the nightingale, these, and more, of such rural amusements and delights, are the true night air, the Malaria, and the fever. Whence else should fevers come? and do they not thus come in Italy and in Africa? Have they other causes in Rome or Mantua than here, and shall we ever learn to believe that they have no other? The Thames indeed is not the Congo, nor can we parallel Ostia or Terracina; the fevers do not slay in three days; but the disease is the same, the poison the same, and the same is the cause.

The remedies, such as they are, for these cases, consisting in avoidance and certain modes of prevention, are, like the fact itself, so familiar, that it is scarcely necessary to enumerate them. The basis of all is, avoidance simply, and, above all, to avoid sleep under such exposure; as the effect of this state of the body in rendering it unusually susceptible of those diseases, is proved by universal experience. The other class of preventive remedies comprises modes of exciting the animal powers by food, spirituous liquors, and so on, or of diminishing its sensibility by narcotics, such as tobacco and opium. Of the utility of these expedients, the experience is ample. Besides this, there are circumstances, such as may occur in camps, for example, as well as in other cases, where the production of fire and smoke may operate, and appears actually to do so, in destroying the Malaria or impeding its propagation.

Hence, in the first place, the general practice in countries noted for Malaria, not to leave the house in the morning without food, or without the previous use of spirituous liquors; and hence also the great use of tobacco in Holland, as well as its adoption by military men in campaigns. To avoid falling asleep, particularly in the night, is the steady recommendation of even the postillions of Lombardy; and I need scarcely remind any reader of travels how the same doctrine is enforced respecting the dews of the intertropical climates.

With respect to the former remedy, such at least is the opinion of that country, as of many others, from experience real or imaginary; and such indeed has been a prevailing belief among physicians as well as the people; as is far too well known to insist on. Yet Rush, from whom it would not be prudent to differ without strong reasons, and Moseley, whose opinions have not always obtained the same respect, assert, that even the moderate use of wine renders persons more susceptible of the yellow fever, or of the remittents of hot climates in general; while, in the noted epidemics of New York, the former physician was accustomed to urge even a great degree of abstinence from food, as a security; confirming his opinions by his own practice on himself. It is assuredly as difficult to decide between contending evidences, as it sometimes is to attain the truth at all in physic. No one doubts indeed that excess, whether in eating or drinking, but especially in the latter, is pernicious in those situations; but it is difficult to admit that a degree of abstinence capable of producing debility should not render the people more susceptible of fever, since this is the admitted effect of every debilitating cause. Nevertheless, it seems necessary here to suspend our judgments, as far at least as the hot climates are concerned: while if the comparative exemption of the French or Spaniards, when compared to the English, under these circumstances, seems rather to depend on the difference between moderation and excess, though probably also, as I shall here presently show, arising from the superior security of a vegetable diet, there may be peculiarities concerned in this case, depending on climate, on which we, unacquainted with the disease in these situations, are not competent to decide.

On this subject however, Sir J. Pringle is decided, and from an experience the nature of which is well known to all medical readers; recommending the use of wine and of a full or good diet, and thus, while he agrees, assuredly, with the great majority of medical practitioners, and with, probably, all the people of Europe, opposing experience to experience and judgment to judgment. Such also was the opinion of General Monnet at Flushing, and such his practice; consisting, like that of the Dutch in general, in giving some spirituous liquor to his men early in the morning: while the same opinions prevail all through France; it being invariably said by the physicians of that country, that the use of wine is indispensible in the marshy districts.

How shall we reconcile conflicting testimonies? unless we should suppose some peculiarity in the fevers of America, or perhaps conjecture what has happened too often in physic, that the American physician has viewed this question under a prejudice or an hypothesis. It may perhaps indeed be the fact, that the remarks in question were intended to apply rather to that contagious, if disputed, fever, the notorious Bulam disease, than to the yellow, marsh, or remittent fever; but even in this case we remain still at a loss; since it has been a general conviction that the use of a good diet and wine enabled men to resist the attacks of all the contagious fevers.

The superior security of the officers to the men in naval, or maritime, service, when employed together in duties on shore, has long been remarked; and if other causes than a better diet, well known to physicians, may be supposed here to aid in the result, I have found that those intelligent naval officers whom I have questioned on this point, attribute their superior exemption solely to the causes under review; assuring me that they had on numerous occasions levelled themselves with the men in every circumstance of exposure, clothing, fatigue, sleeping, and so forth, and that remaining in health while their entire boats' crews sometimes caught the fever, they could not discover any other difference, and had become convinced that the superiority of their diet and the regular use of wine formed their protection. That similar opinions have always prevailed through our armies, as to the relative security of the officers and men under exposure to the causes of fever, in all countries and climates, I surely need not urge; and after all the cross-examination to which this subject can be submitted, so as to abstract and allow for other differences, it seems impossible to doubt that these opinions are well founded.

To speak now of the other mode of prevention to which I have just alluded, instances might be quoted, and from the histories of military campaigns as from other cases, of the utility of fires and smoke; nearly the whole of these useful doctrines being embodied in the philosophy of Uncle Toby respecting the radical heat and the radical moisture. If this has sometimes been disputed, and the action of fires in such cases not seldom also misapprehended, it has arisen as usual, from a confusion of ideas, or a confounding of different circumstances. That in this case they may act, at least in two ways, is obvious; that is, by drying the surrounding air and thus diminishing its conducting power, and by producing a dispersive ventilation, or bringing a salubrious mass of air on an unhealthy point: while I need not insist on their further and medical effect on the susceptibility of the persons exposed to the poison. As to facts in proof of the utility of fires, Lancisi points it out as to Rome; and even Pliny, long ago, declares the same opinion, quoting, further, the authorities of Empedocles and Hippocrates to the same effect. That Napoleon took the same view of their use, adopting this expedient very largely, and with success, when his armies were occupied in the very worst district of Italy, is a specimen of military experience which may save the necessity of quoting others less decisive. One very pointed case, of a civil nature, is also worth recording; because, while it is always particularly easy to imitate, and has been most unfortunately neglected, the circumstances are such as to interest ourselves, as colonists under some of our least satisfactory experiments of this nature. In this case, the superintendant engaged in directing the cutting of wood in Africa, erected thirty earthen furnaces on the spot where his men were employed, lighting them every day. Before this, he had always from forty to forty-eight of his workmen sick; when, in a short time, they were reduced to twelve, then to four, and finally to one. Perhaps governors in Africa may profit by the hint; if indeed they do not already know every thing belonging to this subject, interested as they are in it.

It is perhaps as much out of place here, being a medical rather than a merely physical question, as it is superfluous to medical readers, to notice those conditions of the body as to debility, which render it peculiarly susceptible of the action of Malaria; while it would be utterly so to specify the debilitating circumstances, familiar as they are among medical writers. They are however important facts for the people, even in the case of our own country; and were it possible that such a work as this should ever reach the hands of the multitude, they would have justified a distinct code of familiar rules.

But as I have been in a manner forced into a notice of the predisposing causes of the diseases of Malaria in considering the modes of prevention, I may here examine one, which, while it is not much known in our own country as a fact, or at least a fact established, appears of infinite importance to travellers or residents in tropical and dangerous climates; that importance being also materially enhanced by the extraordinary, and indeed almost universal neglect which it experiences every where, even at this day. To that neglect in particular, it would seem that we must in a great measure attribute the almost universal mortality among our travellers into the unknown parts of middle Africa.

It has been frequently remarked by travellers as well as physicians, that what the latter call errors of diet are, in the tropical climates, common causes of fever: and yet that observation has been so vaguely stated and so little urged, while its nature has also been so little explained, that it seems scarcely to have made any impression. It may not be easy to explain why an action on the stomach so apparently simple as that of particular kinds of food, or that of eating in the heat of the day, should predispose to the fever of Malaria; and we must be content at present with the vague belief that it is a cause of temporary debility.

Not to quote proofs or statements beyond necessity, it may almost be sufficient to refer to Dr. Clarke's observations on the Crimea, where he points out the fact with his usual energy; stating also the substances, such as butter, for example, which thus, in his mode of expressing himself, produce fever. From numerous other testimonies, it appears that the same hazard is incurred by the large use of animal food in the same circumstances, and most of all, if eaten, as Europeans use, in the middle of the day, or frequently in one day; and on examining Niebuhr's account, it is most apparent that the deaths of his companions were the consequences of gross feeding or, literally, of gluttony. It would not be difficult to analyze the histories of other intertropical travellers, so as to draw the same conclusion as to their fates; and, among others, it is not unlikely to be the real solution of the extermination of Capt. Tuckey's party; since the causes sought for at the time did not appear very satisfactory.

On this question there can perhaps be no better evidence than the opinions and practices of the intertropical nations themselves; among the mass of whom this subject seems well understood; while in many countries, it is a caution actually often given to Europeans by the natives, though most generally neglected by them, and most particularly, it is said, by our own countrymen. It is, possibly, from long experience, in some measure, of its advantages, as well as from more obvious causes, that a vegetable diet is so general throughout the aborigines of the torrid climates; while it is doubtless from principle also, that among the people of Africa, to the northward at least, the sole or the principal meal is supper. Among some of the negro tribes, this indeed is not merely the practice, but the very reasons for it are assigned; namely, the hazard or certainty of fever from eating in the heat of the day. This particular fact was ascertained distinctly by Major Denham; and, whether it is urged in his printed account as it merited, or not, it is derived, I am informed, from his strong personal declaration, that he attributes his own preservation to his having thus followed the native philosophy in his practice.

I need not protract this detail; but it interests our colonists or residents in all the hotter climates, and those in the West Indies and India in particular, to inquire whether their principal sufferings have not rather arisen from transferring their gross and injudicious European habits to these countries, than from the mere climate; whether they are not, in reality their own destroyers, from the indulgence of their appetites and improper habits. It has indeed been often said, that very frequently among our armies, and very widely also among the planters of the West Indies, the usages as to diet and mode of life are such as would be ruinous to health, even in Europe; far more under all the circumstances, and in the climates, where such a luxurious manner of living is the habit of society.

And that this observation is not an unfounded one, will be confirmed on a comparison between our own colonists, as well as those of Holland and the northern voracious nations in general, and those of France, and apparently also of Spain; though with a want of observation not uncommon, added to the desire of finding excuses for self-indulgence, the superior durability of the two latter people as tropical colonists, has been attributed to the change of climate being, as to them, less. They who will reflect on what has now been said, and then compare the actual life of a French colonist with an English or a Dutch one, will probably accede to the conclusion which is here drawn.

I may also borrow a fact to the same effect from Captain Symes, and respecting a people not less delighting in voracious eating and animal food than those to whom I have been alluding. He says, it is true, that the lake in Ava which was his abode during his embassy, was not unhealthy; but the Chinese ambassadors, nevertheless, all died of fevers from eating, while his own people escaped, in consequence of better discipline: proving the fact under review, and also suggesting that his report as to the salubrity of this situation was not to be taken in a rigid sense, but in a comparative one.

If, in examining the propagation of Malaria from chemical considerations, I have also been compelled to notice its checks, this is the proper place to state one fact at least which bears upon this subject, respecting which there can be no doubt: while I could without difficulty, support it by other parallel ones.

I have given an account of the propagation of Malaria through Rome, and have therefore been in some measure compelled to anticipate this particular subject. Here, the Judaicum, which might be expected to suffer as well as the streets around it, is always, as I am informed, generally may at least be believed, free from the diseases in question: and what the confinement and filth of that place is, needs not to be stated to those who know Rome, even by reading. It might not be safe to conclude from this single fact, that the propagation of Malaria cannot take place through similarly crowded streets or towns; but the general truth is confirmed by so many more of the same nature, and in so many places, that it may safely be considered as one of the established rules relating to the transference or effects of this poison.

Nor does it seem difficult of explanation; of that general explanation at least which is all that we can expect on a subject where our knowledge is as yet so short of accuracy. The Malaria must be a chemical compound, and therefore decomposable: it is, experimentally, decomposed by fire and smoke, and it is therefore probable, that, amid the unknown mixture which forms the atmosphere of crowded streets or habitations, it is actually destroyed.

If, at present, we cannot speak more precisely as to the cause, the fact itself is, in practice, one of considerable interest, and also of some value. Historically, we can never believe that the fevers which raged in Rome annually during the time of the Roman empire, that the month which "adducit febres et testamenta resignat," the "Septembres horæ" which drove all the opulent from the city to take shelter in their country houses, was as fatal to the lower citizens as to the upper ranks, however the depressed state of these, under a patrician nobility and a tyrannical government, with the want of statistical notices on that subject, may have rendered their sufferings despised, and left our own information imperfect.

It is far more probable that they did not suffer like the more wealthy; and from the causes now laid down: and the history of Rome as to health, then, was probably much the same as it is now; the present fact establishing the former probability. It was, literally, Death knocking at the door of the opulent to spare the mean; not marching "æquo pede" through the "pauperum tabernas regumque turres." And that the causes of prevention in question did exist as to the lower orders, seems plain from a computation of the population of Rome during the most flourishing state of the empire, and from a comparison of this with the dimensions of the city; a computation for which I may refer to Gibbon's essay, proving that the people were condensed into the floors of lofty houses, as in Paris; and apparently also into crowded and narrow streets, as in Athens, the Wapping of Greece. Be this as it may, the poverty of the great mass of citizens in Rome at that time, and indeed at all others, is evinced by the barbarous practice of eleemosinary distributions; which proves, not only a want of industry as well as of employment, but an entire debasement of the feelings, and, consequently, of all the habits of life. They were poor, and their habitations could not have been better than their food. It would be a matter of some surprise, if any part of ancient Rome inhabited by the lower herd of citizens, was even as convenient as the present retreat of its wretched Jews. But I must avoid the hazard of running too deeply into antiquarian researches; it seems probable that a parallel case exists in our own capital.

If, as having been a subject held out to public as well as to official medical discussion, I formerly noticed the ill health which had unexpectedly appeared in the Penitentiary, I am bound to remark, that in rendering it independent of the streets, the intention was good in more modes than one; since neither was Malaria suspected, nor was the nature of the remedy which I have been discussing, imagined. And while it affords a striking analogy to the case of the Salpetriere, though the diseases were different, we may now see why this ill health does not invade the crowded streets of this division: since a Malaria which, in far greater virulence, cannot enter the Judaicum of Rome, must effectually be repelled in this closely inhabited spot. Thus one class of misery becomes the remedy for another: while this explains the doubts of those who, unacquainted with the nature of this check, not unreasonably denied the very existence of the cause. If its operation has been now terminated by a better diet and other regulations, the reasons are familiar to physic: while it is also quite possible that either the production or the propagation of the Malaria, or both, have been dimished by some of the changes formerly pointed out.

I am quite aware that I ought to have quoted many more specific cases than I have done, not only on this point but many others, as examples in evidence; particularly upon those least suspected situations and soils productive of Malaria: since, from not having done this, I have incurred the hazard of diminishing the credit due to these statements, and, consequently, of impeding that utility which has been my sole object; to say nothing of the personal inconvenience that ought to result from asserting more than I have proved. For the former I grieve; the latter I must bear: but it is not for want of local proofs that they are not produced; as I could have amply established in this manner every thing that has been advanced. But when the sole intention of this essay has been the public good, the diminution of sickness and suffering, I could not but recollect that in pointing out insalubrious spots, though for the mere purpose of evidence, and for the sake of teaching the people, by examples, how to recognize the characters of such places generally, individual inconvenience, or even injury, might perchance have followed.

I trust that I have avoided this; and it has assuredly not been for want of anxiety: while, in as far as any occupation of land by means of new buildings, in any situation in England, is intended, it can effect but good, to remind the public of this and the other precautions which may be deduced from the different facts here stated. Thus for example, the substitution of a spacious and airy street for a narrow and ill-ventilated one, might, in such a situation, be hazardous, as the example of Rome testifies: and if therefore it is intended to occupy in this manner, any questionable place, it would be prudent to commence by laying dry any lands which are of a suspicious character; because, in the views here taken, they will, in some season or other, if not in every year, become productive of Malaria and disease.

That I have not misstated the facts, nor the causes, as to any part of England where they may occur, will be vouched by at least every French and Italian physician accustomed to such lands and to the diseases which are their produce; while the endemic autumnal fevers, which, in the year 1826, amounted to almost an epidemic in so many places throughout the country, and in some very particularly, which I ought to have here named were it not for the reasons which I have just given, cannot fail to convince those English practitioners who, from military and foreign service, have been familiar with the disorders of hot climates; however little impression this circumstance may make on others, and on those especially who follow the popular opinions in considering them as typhus, or who, otherwise, under a minor error, attribute the cause to heat simply, or to the use of fruit, or to whatever else of this imaginary nature. And if, in the last chapter, I stated the general revolution of increase which Malaria might experience from the progressive embankment of rivers, I should be deficient in the duty which I have here undertaken, did I not point out how this very condition of things was taking place in many parts of the Thames; though little perceived or understood by the people, nor justly apprehended except by geologists and engineers. If I forbear to specify the exact spots, however involving the health of the capital, for the reasons just assigned, the mere pointing out the general fact and its theory as it concerns us, will suffice for those who may be interested locally, and who may have it in their power to apply the remedies by a more efficient and extended drainage; not longer to be commanded for many places, by flood gates and low water canals, and demanding now, what in reality these have long since done, the use of lifting machinery.

It is so easy to apply the general principle in question to the explanation of all similar cases, that I shall here terminate this particular discussion, and proceed to examine that problematical fact to which I have lately alluded, relating to the personal prevention of disease under the presence of Malaria. The fact, as it is stated, is simply this; that by surrounding the head with a gauze viel or *conopeum*, the action of Malaria is prevented, and that thus it is possible even to sleep in the most pernicious parts of Italy without hazard of fever. In Malta and elsewhere, this belief is universal: and hence the popular practice of covering the mouth and nose with a handkerchief, in the morning on going out, or in other suspicious circumstances: a practice, the efficacy of which is attested, as far as popular belief can attest any thing. Thus also, in Spain and Portugal, it is a common or universal habit to draw the mantilla over the mouth when in suspected places, as also in foggy weather and east winds. Perhaps however it is a fact yet wanting confirmation; but it is not improbable on theory, because we can thus conceive an atmosphere from the lungs, accumulated within the veil, capable of decomposing the Malaria. A popular practice in fogs, in our own country, that of applying a handkerchief to the mouth and nostrils, may not therefore be so fanciful a prevention of disease as it is a vulgar one; however often misapplied.

On this subject, I may add that I have suggested to different naval officers, the propriety of at least trying this experiment in a manner and on a scale which could scarcely fail to give a true result; while if it did prove successful, its value would be far greater than is easily imagined by those who are not acquainted with the details of nautical service on the African coast and elsewhere, and in the former, very particularly, in that destructive service, the cutting of wood. It would be abundantly easy to make the comparative trial on two boats' crews employed on the same duty; and as it much too often happens that every individual from one boat is seized by the fever after such an expedition, even a single trial perhaps, or at least a very few, would determine the question; while the experiment is amply justifiable, inasmuch as it is not one which exposes life, but which attempts to preserve it. As yet, I have not succeeded in procuring this trial to be made; and if the publicity which I am attempting to give to it here, is not likely to be very great, it is still possible that the hint may at some day reach the ears of those in whose power it may be to put it into practice.

It is true that there is an objection to this opinion, founded on a theoretical view of the action of Malaria on the body; but before it is admitted as a valid one, it ought to be proved that the theory is true. It is Brocchi who argues most strenuously to prove that the poison is received by the skin and not by the lungs; and as the question is of some importance, I must both give and examine his arguments.

It is certainly not a point easy to prove by any direct means, that the poison of Malaria is received by the lungs and not by the skin; yet it would be a very natural *priori* inference, that, of two surfaces, that which is most perfectly exposed to the action of air, which is infinitely the most sensible, which is also the most extensive, and which, lastly, does decompose the air which it receives, should be the real agent in the transmission of this substance. To argue from Richerand, as Brocchi does, that because (supposing it even true) the absorbents of the skin are most active during sleep, and because Malaria attacks a sleeping person most readily, the poison must enter in this manner, appears sufficiently puerile, when we know that the peculiar state of the body in sleep, is favourable to the access of many other diseases. And if, as is a prevailing opinion in many parts of Italy, and in Malta also very especially, the practice of covering the mouth, which I have just noticed, does prevent danger, here is a direct testimony for the reverse conclusion.

But it seems unnecessary to argue this point on the grounds of physic or physiology; since, with little of direct evidence, every one will, as usual, conclude according to his favourite hypothesis. Yet in as far as the writer in question attempts to support his theory by the history of ancient Rome, his arguments appear sufficiently weak. As I have remarked elsewhere, he tries to prove that the difference of salubrity in the former and in the present times, arose from the use of woollen clothing, or of the toga, by the older Romans; and, refining still further, endeavours to trace the increasing severity, as he imagines, of febrile seasons in the time of the empire, to the increase of luxury and the substitution of silk and linen for wool; attributing also, idly enough, the fact that the inferior animals are not affected by these fevers, to their furry or hairy coats; an imaginary fact also, since I shall hereafter show that this is not true.

The period in question commences at the decline of the republic, as is evinced by the attack of Cicero on Cataline; the toga gradually giving way to a lighter garment, and the use of silk becoming still more common in the reign of Tiberius. It is however unnecessary to pursue this, nor to examine the collateral arguments by which the opinion is supported; deduced from the fact that the rich only left the city, because, says Brocchi, their light and luxurious dresses rendered them peculiarly or solely susceptible of the fevers, and from others of equally little bearing on the question. The rich migrated, while the poor could not; and to whatever other causes the relative states of health at the various periods in question may be attributed, I have examined them as far as they present any probabilities, in another place. I shall only farther remark, that the time fixed on for the supposed increase of unhealthiness, is precisely that when luxury and ease, and I may add the new existence or increase of physicians, rendered questions of sickness and health matters of more attention than before; and when also the increase of writers produced records which could not have existed at earlier periods.

But I think it fruitless to pursue further a speculative opinion of this nature; admitting only, the propriety and utility of warm or non-conducting clothing, even of wool if any one shall prefer it, on the well known grounds that cold and wet, or exposure generally, is injurious, as aiding the activity of all contagions or diseases, and of Malaria and its consequences among the rest; while also capable, as I have elsewhere shewn, of renewing a fever of habit without a fresh application of the primary cause: possibly indeed, capable in itself of generating intermittent or the other diseases of this class.

That I may not be obliged to recur to this question, namely, the mode in which the poison of Malaria is introduced into the system, I may as well remark here also, that there is a third party which supposes that it acts through the intervention of the stomach; while some, wishing possibly to reconcile or unite all opinions, conceive that it acts on every accessible surface; on the skin, the lungs, and the stomach. That the plague, and that contagious fevers in general are received through the stomach, has, it is well known, been a very common opinion; and there are certainly not wanting facts to give a colour to such a theory, though short of that evidence which should produce philosophical conviction, while not a little opposed by the well known experiments which indicate the power of the stomach in decomposing certain animal poisons. I need not re-examine so hacknied a question; while, as I have just remarked, it is probable, that, as is usual under defective evidence, each man's opinion will be regulated by his affections for the one hypothesis or the other. That my own opinions are undecided because the evidence is insufficient, is perhaps apparent; however little that state of willingness to wait, may concern the reader.

It has been asked whether Malaria might, like contagion, be carried in the clothes of a person, or retained, as all those are, in a dead substance, so as to communicate the disease at a distance of place and time. This is a question to which I alluded in the commencement of this chapter; and which, if I passed by it then, I would gladly pass now, if I did not feel that it was necessary to prove that at least I had not passed it from indolence, but from the difficulty of saying any thing satisfactory respecting it. It seems almost impossible to find an answer to this question, from experience; as, in almost every instance where we might seek to find it communicated in this manner, the fact that every individual may have been similarly exposed to the original source of disease, renders the investigation nearly impossible. It is a doubt that might perhaps be put to the test of direct experiment; but I cannot discover that any such trial has been made. It is perhaps indeed more a question of curiosity than use; though nothing is useless in philosophy which tends to make us better acquainted with the subjects of our investigations. If we could rely on *priori* reasoning, we should perhaps decide that this was possible; since we can see no cause why one compound gas should not possess this property as well as another; Malaria as well as contagion. And there, for the present, must we rest.

If, as somewhat diverging from this question, that much more important one, namely, whether the fever of Malaria can propagate itself from one subject to another, is rather an inquiry belonging to the medical division of this entire work, I know not but that it may as well take its place here. That it has been a subject much discussed, and with no small energy, or even acrimony, I need not say, while, as on many other much argued points, the contending parties have often been divided, from neglecting to commence by a mutual understanding of the objects in dispute. Whether any particular endemic or epidemic was or was not a contagious disease, is a somewhat separate medical question; on which I shall not now touch, as the inquiry here is of a different nature.

The facts proving that remittents and dysenteries unquestionably arising from Malaria, have, in their progress or continuance, become contagious diseases, though not so originally, are numerous, and rest on as good authorities as physic has to produce. When I quote Pringle and Lind and Blane, referring to facts well known to physicians, and which I need not therefore extract, the authority seems not of a nature to be doubted; though it is as positively contradicted by Pym and many more, as it seems to be, very generally, in France. Nor is it easy to see where the objection lies. The assertion, or the fact, does not imply that the fever of any one individual did reproduce, through his secretions, a Malaria similar to the original one, and therefore a fever or dysentery of Malaria; but merely, that, under such a state of disease, the morbid secretions in question became the source as well as the matter of the contagion; as happens even with respect to healthy persons under peculiar and well known circumstances. The original disease disappeared, and a new one was produced; or, in the morbid individual, one fever was converted into another of a different character; just as, under other diseases, a contagious hospital disorder of any nature may be superinduced on the first, even to its extinction. Or, it is not that the remittent fever of marshes is contagious, but that it may become, or give way to, a contagious fever. It is perhaps a certain heat of temper excited in maintaining a recent hypothesis, which seems to have viewed this subject in a different and unfounded light, leading to much superfluous and some angry writing.

I have reserved to the last place one of the most difficult questions relating to the propagation of Malaria; a question in which is involved that of the peculiar effects of east winds; and it relates to the distance to which the poison can be transported. It is admitted that the subject is obscure and disputed; but that must not be an obstacle in the way of its examination.

While it is asserted by many writers that it cannot be transported beyond a very moderate distance from the place of its production, or that it is almost limited to the very spot where it is formed, there is evidence to prove that this is a groundless opinion or the result of bad observation: while, like much more of assertion, on this and every other subject where medicine is concerned, it may be traced to a far too common practice among writers, on this, and on other physical subjects; when, unable to throw light on a difficult inquiry by their own knowledge or powers of reasoning, they attempt to attract attention by opposing whatever is advanced by research and ability.

To commence with an indisputable fact; what I have already noticed respecting the propagation of Malaria from the Thames over the hills of Kent, proves that it can be conveyed through the winds, to distances of some miles from its original place of production; while there would be little difficulty in finding numerous other similar instances, and equally marked. And as, in this particular case, the original Malaria, whether as to quantity or virulence, cannot be very considerable, it is easy to believe that in more favourable circumstances, it may be transported to distances far greater.

And, by analogy, we can see reasons in confirmation of this opinion, as it is further supported by certain meteorological facts. Odours are conveyed, notedly, to great distances through the air, and often in a very concentrated state; and it is not easy to conceive how the quantity of matter in Malaria can be much less than the quantity of the matter of odour, while it is certain that inappretiable quantities of this, as of all contagions, are sufficient to produce their respective diseases. If the "Sabean odours" and "spicy gales" of Arabia range the seas of that shore rather in poetry than in reality, it is certain, not only that dogs can smell the land from sea, long before it is visible, and at very great distances, but that it is sensible to our own organs when many miles distant. And thus also can the smell of the sea, which, in reality, is the smell from fish, be often perceived at great distances inland; as the odour from a large fish at sea, from a whale or a shark, is often extremely powerful, and even offensive, as far off as the spouting, or the animal itself, is visible from the mast head.

The meteorological argument rests on the distances to which local or limited fogs can be carried by the winds, and to the often enormous ones to which even a very small cloud can be transported, without the loss of its integrity. Here, it is plain, an extremely tender aggregation of a substance which may almost be considered a gas, is maintained entire, by some internal affinity of its own, while floating in another gas, and subject to a degree of mechanical violence, independently of destructive chemical actions easily conceived, which should be supposed capable of causing its immediate dispersion.

Why might not a Malaria possess the same means of preserving its integrity, and the same power of undergoing transportation? No one dares decide on the impossibility; yet that, it must be owned, is not a proof that there is this power. It is however rendered directly probable by the following fact. It has been shown that Malaria combines especially with a moist atmosphere, or with fogs and mists. It is, in reality, combined with a cloud; and since that is indefinitely transportable, we can see no reason why the Malaria should not also be transported with it. If not decomposed by this union at first, there is no apparent reason why it should be decomposed afterwards; and thus it may travel the atmosphere, under the protection of its original receptacle, to distances which we can scarcely venture to limit.

And, to a certain extent, experience proves that this actually happens; that the cloud is not only the vehicle of the Malaria as it is its receptacle, but that it does transport this poison to considerable distances. This is precisely the popular, as well as the philosophical experience, respecting the diseases wafted by fogs; and the only question that remains, relates to the distance. Theoretically, we might decide, that as far as the fog produced by, or over, a land of Malaria travels, so far might the Malaria itself be carried, even without the aid of this vehicle; and it only remains to inquire what experience there is as to the actual distance so travelled; a circumstance to be determined only by examining into the diseases produced in this manner. On this subject, I can find no observations of any great value or precision; but as it deserves to be examined, these suggestions may perhaps prove a stimulus to its future investigation.

Yet I must offer a few remarks that bear on this fact, of which the first appears sufficiently precise as far as it extends; the latter will doubtless be a subject of dispute.

Seamen observe that the land breeze in tropical climates brings off with it the fevers of the shore: and indeed were this not the case, we could scarcely account for the production, in certain instances, of the common remittent fevers at sea, when in tropical climates; while, partly perhaps from inattention to this fact, though more, doubtless, from a confusion of ideas respecting fever, this disease is often mistaken for contagious typhus. I allude here to the appearance of fever in clean ships, or in cases where there has been none while at sea, but where it has appeared on coming into harbour or nearing the land; because I have formerly shown that bilge water will, in all probability, often explain the production of fevers when in the ocean or far from land. I have examined voyages and made inquiries in vain, to find a large limit of distance as to the appearance of the remittent fever at sea; but have had little success, from the want of corresponding entries in the log book, to compare with the event. If I have imagined that I could produce examples of this occurrence at far greater distances than has ever been imagined, I prefer avoiding to insist on such cases; while perhaps others, hereafter, may be induced to turn their attention to this subject, and to note facts that shall have the sanction of accuracy. But I must also observe, that the fact just alluded to, the production of fevers by bilge water, will always throw a doubt on any conclusions to be drawn in this manner, or perhaps impede the investigation altogether; unless we could at the same time be assured of the cleanliness of the vessel in question.

But however I may have failed, myself, in procuring such evidence on this subject as I should have desired, I have not the least doubt that this information is to be found among naval officers and surgeons; and while the present discussion may hereafter induce others, in the way of criticism or assistance, to give to the world their yet unpublished knowledge regarding it, I shall not be surprised to find that to whatever distance a tropical land wind reaches, under a favourable state of atmosphere, at that point of a cruize has the fever also appeared in many instances. That within moderate limits, such as four, five, six, or more miles, the fever, or the Malaria, is blown off the shore to ships, I have found distinctly recorded in the ships' journals in different instances; as I have also been repeatedly informed that the smell becomes immediately sensible: while officers aware of this danger on these coasts, quit the deck to go below, at the moment they perceive this change to have taken place, or even, on some occasions, weigh their anchors and run to sea. And though I have quoted one specific case of this nature in the medical part of this work, the accuracy of proof which it affords is so remarkable, that I must notice it here. In this instance, with a healthy ship and crew, anchored at least four miles from the shore, a sudden change of wind brought out the smell of the land, on which orders were immediately given for weighing; while, even before the cable chain could be cleared, most of the men working at it, who were the only ones first permitted on deck, were seized with disease which proved the fatal cholera to the greater number.

Of other observations, I must give such as I can find; while, if I do not place any great confidence in their value as to the question at large, I am justified in this, from the manner in which they are recorded, and in which the supposed limits were attempted to be ascertained. That they do not even approach to the maximum, which is the question before us, is at once evident.

Monfalcon, speaking very vaguely, and without adducing any proofs, presumes that the Malaria never reaches above five or six hundred yards perpendicularly on the acclivity of a mountain, nor beyond three or four hundred in a horizontal direction, provided it be calm. This may possibly be an approach to truth as it relates to the former case; but in a calm, there is no apparent reason why it should even extend so far from the place of its production, since there is no horizontal current in this case, while there is very often a vertical one in the other. When, in the

West Indies, it has been plainly ascertained to reach to three miles at sea, it is Lind (I think) who seems inclined to make this a maximum; yet from facts far too partial and limited to permit such a conclusion. Another observer, equally decisive, attempts to establish a maximum from a single observation, namely at Walcheren; and thus, by others if not by him, 3000 yards has been fixed as the boundary which it is not to pass. If it spreads three miles in the West Indies, and if, similarly, it is proved that, from the Lake Agnano, it reaches three miles to the convent of Camaldoli, seated on a high hill, it is plain at any rate, that the maximum derived from Walcheren is too low; while, though I cannot find a definite point fixed by the different observers who appear to have taken views of this subject not unlike my own, I may name Volney, Orlandi, Senac, Foderé, Lancisi, as admitting that it spreads to great distances; as is also believed very extensively in Italy, in Corsica, in India, and elsewhere. I may proceed to state what further has occurred to my own reflections on the same subject.

The first fact is derived from our own climate, and it relates to the appearance of the diseases of Malaria on our eastern coasts in east winds, particularly in spring; since, as far as my observation goes, this transportation is limited to intermittents; a fact for which the reasons will shortly be sufficiently obvious. And I must here take, first, the case of a fog or cloud, as being the simplest, and as the rigid continuation of the present inquiry.

It consists with the experience of all the inhabitants of our eastern shore, that the ague often appears with the fogs of spring which arrive from the sea; that, in fact, they are brought in that fog which is popularly supposed their real cause. Now, if, in Essex or Lincolnshire, there are cases where the Malaria might be generated from the immediate land, appearing to have arrived in the fog, only by a deception, there are points on the coasts of Norfolk and Suffolk, as in many other places, where no local Malaria exists for many miles, and in which, if the agues did not arrive in the sea fog, they could not appear at all. And this is no less true of the eastern coasts of Scotland where ague, as a local endemic disease, is unknown, and where no Malaria is generated.

What then is the solution of this? Obviously, that on which I have just speculated, and which these facts confirm. Holland or the shores to the northward are here probably the sources of the

Malaria, and it is transported to our own coasts in the fog and by the east winds. It is never brought by west winds and fogs to the western shores, because there is no western focus of Malaria; nor by northern ones, for the same reason. To assign the cause to the east wind simply as such, is to assert that the atmosphere is itself a Malaria, or that water is the poison; since, of these two things, the chemical compound, air, and water, is pure wind compounded: it is to abandon the whole theory of Malaria, supported as it is by the most uncontrovertible proofs, or it is to assert that of which there is no proof, nothing but the assertion of bad observation; that the air alone in a particular state, or mere cold and moisture, will produce original ague. If it did this, why is it not as common in the frozen or cold regions as with us; why does it increase with heat and vegetation; why does it attend exclusively the season of vegetation, and why do not the dry barren deserts of Africa produce the same fevers as its swamps and jungles? The air and its water are vehicles of poison, not poison; mediums for communicating diseases, not causes of disease. After this, why persist in that undiscriminating and slovenly philosophy, if philosophy it may be called, which attributes the diseases of Malaria to wind and fog, because they chance to come from the east rather than the west. Were such wind, *per se*, the cause of fever, when and where would the lands under the trade wind be exempt from disease, and how should even a ship escape amid the equatorial seas? St. Helena would never be exempt from agues! and the family of Napoleon at least, exposed to the perpetual south-easterly fogs at Longwood, would scarcely have avoided this fate; whatever security he might have acquired from having breathed his first air at Ajaccio.

This question is so important in a merely medical view, that I must here urge it, since it is one that will not recur in the future parts of this essay. It is from carelessness, or from want of observation and of reflection, as well as from the habit of following the phraseology of medical schools instead of reasoning, that physicians, and the people in consequence, persist in talking of cold and moisture, and moist winds, and east winds, and fogs, as the causes of intermittent; having, with somewhat more of reason maintained, and possibly, as to some points, proved, that they generate sundry other diseases; and thus confounding both causes and effects, because these are particular winds and because there are accompanying disorders. The queries that I have just put on this subject can be answered decidedly. The east wind is as cold and as bitter when blowing across a frozen continent as it can ever be; yet it produces no intermittent fever, because vegetation is dormant, and decomposition is at a stand. If it blows across an extent of even unfrozen land in winter, it may cause diseases, but it brings no intermittents, for the same reasons. Here, it may be moist, and even foggy, as well as cold, as it is when it blows across an ocean; and in this latter case, it does not produce intermittents, even in summer and when vegetation is active, provided it has swept no lands in its way. To be injurious in this sense, it must be a land wind while it is an east wind, and it must also blow, in our half of the globe, between March and October; while, if it conducts fever better than another wind, it is only when it chances to be a better conductor than that one, or, when it is a moist wind.

But it is not always a moist wind; far from it: being commonly, in summer, the driest of winds, just as it forms, in the same manner, the burning and absorbent Harmattan in Africa: and when it is such, any other wind may exceed it in conducting power, while that will become the wind of intermittents; the very east-wind, as to all its morbid qualities, of the vulgar, provided it also traverses a land generating Malaria. Hence, as I shall presently show, does it arise, that even the east winds from Holland which bring intermittent in spring, do not equally bring the autumnal fevers; because, even when they do blow, being at the same time less frequent and less rapid in movement, they are comparatively deprived of that especially conducting, and, chemical power, which they derive from their union with hygrometric water.

In addition to what I have more generally said on that subject, it might be shewn by a geographical detail, for which, could it even now be thought necessary, I dare not occupy room, that the action or effect of the east wind is not the same everywhere, and that, in the production of the diseases of Malaria, its power depends on the relative position of the poisonous lands and the persons suffering. It must be sufficient to point out one, almost at our own doors. In French Flanders, it is the south and the south-west winds that propagate the diseases of Malaria; and the reason will be evident on inspecting the geography of this tract. And there, it is the north, and also the north-east, which remove them; because they blow from the sea; though charged with fogs to darken the whole land. This is the true view and the philosophy of every case. It is not *quoad* fog, any more than *quoad* east, that either the fog or the east wind is the parent or vehicle of fevers: it is in the sources of both that we must seek for the true causes, or in the lands which, if not their sources, they sweep in their progress.

But I must now examine this question a little more freely, and inquire somewhat further respecting the east wind, simply, and independently of the transportation, by its means, of distinct fogs or clouds.

It is a popular observation that the east wind itself, in our own country, at least in spring, is the cause of agues; and an experience sufficiently extensive and accurate proves that this observation is well founded: while it is not a fact, after what I have just said, requiring detailed proofs or a more minute statement. The opinion, or the fact, as to other countries, involves too wide an extent, as it is also too difficult to verify, and I must therefore pass it over; while the object here being to prove the general principle, it is sufficient if it can be demonstrated from this selected case.

Now we must here distinguish before we can proceed. If we take the higher and western part of Lincolnshire, for example, the east wind that reaches it must cross the fens not far distant. This may be a very ordinary case of the propagation of Malaria by winds. Thus it is also for the eastern side of London, exposed to the transported Malaria of Essex. It is not always a pure case when the inland districts of England suffer.

If it is a collateral remark, it is not an uninteresting one, at least to the people of London, that, at all times, the seasons of remarkable east winds have been its seasons of intermittent. This was the fact with regard to the years 1765, 1766, 1782, and 1808; and it has been similarly the case for these two or three years past, as, for one of these at least, the records of the London Hospital will particularly testify. And it is further remarkable, that, in some of those years, the lands to the eastward that used to generate intermittents only, produced continuous and remitting fevers. Here, among other matters, while transportation is proved, it is also apparent, as has been here remarked in different places, that, under varying circumstances, probably of quantity or intensity, the same land, and in the same season of the year, produces both ague and remittent or continuous fever; and that the difference between dilution and concentration in the Malaria, will be, in effect, the difference between intermittent and remittent fever; that is, supposing this to be an unvarying compound.

But if, returning to the question in hand, we go forwards even to the sea side itself of the eastern coast, we find the same rule prevail as in the more marked instances of fogs. A simple or transparent east wind brings the diseases of Malaria, at least in spring; for the distinction is important, as I have just shown, between this season and the autumn. Here, as in the former case, if there could be any suspicion that the diseases arose out of a Malaria produced in the immediate soil, it is removed by the fact of their occurring in Scotland, in places where that poison is totally unknown, and in similar clear states of the atmosphere. Thus, for example, on a sudden change of the wind to the east, soldiers in the Castle of Edinburgh, susceptible of the disease from former habits, become immediately affected, when a north or north-west wind, equally cold, does not produce the same effects: while, in other places equally free of the endemic disease, a new disorder is even produced in a new subject.

The fact being thus supposed established, there appears no reason why it should not deserve credit, from general considerations; or we may try the question according to principles or theory. I have shewn that a moist atmosphere is a peculiarly apt conductor of Malaria; and this is the general character of the east winds of spring. If they can conduct it to certain distances in the dry state, they may convey it much further in the moist one; while we must also not forget, that the mere circumstances of cold and moisture may possibly render the body more susceptible. And if the clear tropical winds can convey remittent far to sea, it is far from unreasonable to suppose that the east winds which reach us from Holland, may bring the Malaria of that country with it, though they should not convey a fog or a cloud at the same time.

In a meteorological view, there are other reasons also in favour of the possibility of such a distant transportation. One of these is, the rapidity with which winds travel, and, what is more important, the singularly steady, linear and horizontal direction united, which they sometimes assume, so far different from that intricacy which was formerly pointed out. And here it is peculiarly worthy of regard, that while this steadiness of parallel flow is much greater at sea than on shore, so is the east wind that one which is particularly steady and uniform in its current, and most of all in those seasons in which it blows continuously for a long period; the very fact in the case of the east winds of spring. Under such circumstances, though there were no facts to prove it, I cannot see why Malaria should not be conveyed in a moist east wind, to distances even far greater than that between Holland and England, and without such a dispersion as to destroy its powers: as, in the same circumstances, such dispersible substances as swarms of insects are even brought over in solid columns, and not unfrequently in narrow ones.

Let me make yet one remark of a meteorological nature which may throw some additional probability on this view, even though the fact itself should be more rare than I believe it to be. In a very different work from this, (on the Highlands of Scotland) I have shewn that a current of wind will sometimes be found, blowing for a considerable time, with great steadiness and rapidity, in a straight linear direction; occupying an undefined and undiscoverable space longitudinally, yet not exceeding a mile or two in breadth, while accurately separated on both sides from a calm or still atmosphere, or producing there nothing at least but that narrow eddy which is an inevitable consequence of such a state of things. And I have, in the same place, further shown, that two such currents will thus blow, of similar dimensions and rapidity, in directions exactly the reverse of each other, and also in contact, or as nearly so at least as that can be proved by the manoeuvres of vessels under these circumstances. And lastly, I have there shown that such currents will even cross each other's courses, as apparently unimpeded, or undisturbed, as this can be proved by the same mode of investigation.

The conclusion from these facts, as to the question before us, is not unimportant. It is plain that in all these cases, each successively rising in value of proof, a mass of air in motion possesses some principle of integrity, self attraction, or resistance to the surrounding fluid or forces, whether chemical or mechanical, capable of preventing its dispersion, or its solution in, or mixture with, the surrounding atmosphere, even amid the most apparently disturbing causes. It is like the case of a cloud, which thus travels through many miles of atmosphere, even when extremely minute, and when surrounded also by other clouds, without either mixing with them, or losing itself among them, or in that air which, under some other condition, becomes its rapid solvent. This being so, we can scarcely avoid supposing, that in the case of the wind or of the cloud, or, whether the water contained in the stream of air is invisible or visible, any given portion of that wind will keep its relative place as to the rest, during its flow, just as the cloud preserves its place, with its integrity, in the stream by which it is conveyed: or that such portion will arrive at its destination as independent or entire a body as it arose, and consequently, that the same will be true of the whole current.

The practical conclusion as to the question under review, is obvious: and it is, that should such a current contain Malaria, having arisen in a soil capable of generating it, or having passed such lands in its course, it may carry, and can indeed scarcely fail to transport, that substance to the most distant point which it is destined to reach; since at any point of its whole journey, it is precisely the same air and the same body of air, in the whole and in all its parts, as it was at any other point. Coming from Holland therefore, any part of such a current should produce the same effects on him who may be exposed to it, as if he had met with it in its native marshes; just as it would have been the same whether he had breathed the cloud whose motions he has traced through miles of air, on the mountain where he stands or on that where it was first formed. As a further illustration of this, I shall only add, that as it is probably to similar narrow and parallel currents that we must often ascribe the narrow columnar flights of migrating insects just noticed, so this seems to show a similar state of interior integrity or steady relativeness of place among the parts of such a stream.

I need not pursue this particular subject further, and I will gladly leave it, even to the controversy that it will probably excite; indifferent to its standing or falling, provided the truth, whatever that may prove, is elicited. There is nothing but truth in this world which deserves the pursuit of a wise man: and to him, attain it who may, it is equally valuable.

But I must yet answer an objection; which I bring forward myself, lest it should be overlooked by others. If the east winds of spring bring intermittents from Holland, why do they not bring remittents in autumn? The answer does not appear very difficult; while, if I have already been compelled to anticipate it, I must place it here in contact with the objection.

It is a common opinion that the east wind is always of the same quality; always equally injurious or disagreeable, always moist and harsh. It is even a proverbial error, and an error of a wide nature; since it is maintained, that, all over the world, in all places, and in all seasons, it is sufficient for the wind to be east to be always of the same quality; always disagreeable and always injurious. Such, in a thousand other cases than that of the east wind, is the sweeping nature of popular and ancient dogmas. And yet it is not a vulgar dogma; since it has been stated *ex cathedra* by professors of natural history, since it has been asserted by meteorologists of the highest name, and has even been held out as a problem for solution. It would have been well to have ascertained the fact first; as has proverbially been said of many others. It is like the wind that must change with the moon, the storm that must follow a red sun-set or a halo; one of the endless superstitions by which the world is governed, not only in physics, but in morals and politics. It is the balance of trade; and, like the balance of trade, the wisdom of our ancestors will some day become the jest of their posterity.

In summer and hot weather, the east wind is often as notoriously dry, as it is moist in spring and in wet seasons. It is the driest of winds; it is even, as I have just said, the Harmattan of Africa. It is the wind which, with us, attends, produces, the burning heats of our burning summers; as it is the very cause of the extreme power of the sun, from the facility with which, owing to its freedom from water, it transmits light or heat. It would be singular indeed, if winds of such opposite properties as the east winds of March and those of July, should have the same effects and produce the same sensations, because, in both cases, the direction happens to be towards the west. We must leave this philosophy to the vulgar, to whom it belongs: the point which I am to prove is, that the conducting power as to Malaria, of a summer east wind, cannot be the same as that of a spring or a winter one, because they are different chemical substances; and hence it is explained why the remittent does not travel like the intermittent, or why Holland cannot transport to us its Walcheren in August, as it sends us the agues of its ditches in spring.

Enough of this subject: but I must hazard another remark on the east wind, though it is rather of a medical than of a purely physical nature; while it is not such as to have properly found a place in the second part of this essay.

The east wind is a popular grievance; every one suffers, or thinks that he suffers, from it; for it is sufficient if some can talk where others feel. Imagination is worth a great deal in all such cases. Every one indeed may feel its dampness and its cold, and its cutting asperity; and there are some who may really suffer more deeply in their general feelings as to health or common enjoyment, from this cause. So may it produce real diseases; for the application and the continuance of cold and moisture, particularly under the act of perpetual renovation, are not innocent.

On these, it is not here my business or design to dwell. But there is somewhat more behind; indefineable or undefined sufferings, too often the subjects of ridicule or doubt to those who have not experienced them, sufficiently serious to the unfortunate who are their victims. The supposed nervous and the supposed hypochondriacal are here among the chief sufferers; and long as these have been the jest of prose and poetry alike, the jest of rude health and selfishness and ignorance, who shall dare attempt to claim some compassion for them, or to prove that they are sufferers in the body and not in the spirit alone? even were this last a fit subject of jesting.

I am not going to deny that the common and obvious properties of the raw east wind may painfully affect constitutions of the description now mentioned; but what I do mean to say, and what I hope to demonstate more fully in the second part of this essay, is, that in many of these cases, the real effect produced by the east wind is the renewal of a chronic disease, which, in its fundamental properties, as often, most demonstrably, in its origin, is an intermittent. And while I hope to prove that there also is a common modification of this disease, even as an original one, too slight and undecided in its form and recurrence to attract the attention of patients as a fixed and serious disorder, far less that of physicians, and while also I believe that the latter have most culpably overlooked or mistaken its nature, it is this common disorder which I believe to be the chief source of the very marked, and also very common suffering produced by the east wind. In plain language, its effect is to produce a fit of ague, or a continuance of that vexatious disease; and, in a thousand instances, when it is not at all suspected, and where also, very often, the patient is accused of hypochondriasis, nervous feelings, or feebleness of mind.

Were I inclined to extend these remarks further, to the whole of the popular fancies respecting the east wind, this would not be a fit place for the inquiry; nor do I feel any desire to enter the lists further against common opinions, sensible that I have already brought a host to the encounter.

Yet if the east wind is equally pernicious all over the world, as is the popular theory, and as is even seriously asserted by philosophers, even to the very words, let it be explained, first, what is the common principle which unites all east winds, and which can possibly act on the body as a common cause, when it is so easily proved that, independently of any supposed Malaria contained in it, all its obvious conditions, heat, cold, moisture, dryness, are everywhere variable, and everywhere different. It is not any mystery or charm comprised in the term east that can act on the human body. And in matters of fact, is the east wind that traverses frozen Siberia the same east wind that sweeps the burning sands of Africa, or is this latter the east wind loaded with the produce of American swamps? Is the trade wind of the wide ocean the east wind of March in Lincolnshire? is it not, on the contrary, as innoxious as the west winds of the Atlantic in England? It is the very salutary sea breeze itself of the burning islands of Western America.

In many parts of the continent of Europe, in

France, in Germany, in Poland, in Russia, the east wind is often perfectly inoffensive; it is neither spoken of nor thought of, and for reasons not generally difficult to assign. If in the latter, Petersburgh is a noted exception, there must be causes, and very probably consisting of some peculiar direction in the course of the wind, which have not been investigated. In Sardinia again, its effects are such as to render that side of the island which is exposed to it a desert, while a vigorous vegetation flourishes beyond the range of mountains which divides this country: and thus also, in Minorca, it will not suffer an orange tree to protrude a leaf beyond the shelter of a garden wall. These, and hundreds of similar occurrences, confirm the fact that its effects, on vegetation as on animals, depend on the ground which it has traversed, and very materially on what it has crossed last: on its acquired qualities as compared to the west wind, or else on its comparative force. If, in one country or on one coast, it is the east wind that burns and checks vegetation, on another it is the west; and thus, even in our own island, to select two purely local and limited examples only, out of far more, it is before the east wind that Mount Edgcumbe roots its splendid trees even in the sea, not daring to show a leaf to the western ones; while in Southampton river, it is precisely the reverse, and while the contrast produced by the proximity of a vigorous and a stunted vegetation, on immediately opposed shores, is here most striking.

The popular philosophy requires to be reviewed, and not only so, but to be abandoned. The east wind may be poisonous where it carries Malaria; it is a cruel and bitter wintry wind across Siberia, and it is raw and harsh as it travels a land of cold swamps or a frozen ocean; while it is burning and dry in the Sahara, and even in our own English July. This is the east wind; it has bad properties when it blows under evil circumstances; and the worst of all these, as it is the apparent cause of its ill reputation is, that, to us, and to others also, it is the best vehicle of the ague.

CHAPTER VIII.

On the seasons and climates peculiarly favourable to the production and propagation, or to the effects, of Malaria.

As it is a well known fact that remittent and intermittent fevers are more or less severe in different climates, and in different seasons in any one country; it must be concluded that the production of Malaria is modified by differences of temperature, or else that its effect in producing those diseases is thus modified. Either of these two may be the truth; or else the result may be compounded of both; so that in this case, unfortunately, as in many others in physic, among conflicting circumstances, we cannot always hope to discover exactly what the fact is. And as we can judge but by the effects, it is not safe to speak, except with some reservations, as to the effect of season, or heat, in the production of Malaria. The effect of heat on the body, simply as such, is supposed to be to produce disease, or a disposition to disease: and that of long continued heat is thought to be to affect the biliary system in some manner, so as to excite an increased or a morbid secretion, the source, among other things, of cholera. Hence we can conceive that if Malaria is applied to a system thus prepared for disease, the result may be fever, or dysentery, and that the effects may be severe in proportion to the previous preparation or susceptibility. Thus, that extent and severity of disease which might seem the consequence of an increased or unusual quantity and virulence of Malaria, may depend on nothing more than the unusual condition, both in numbers and susceptibility, of the subjects to which it is applied.

But, on the other hand, since it is ascertained that a certain state of vegetation or vegetable decomposition is the source of Malaria, and that this process requires heat and is suspended by cold, we are entitled to argue that as heat does produce, in its gradual increase, a corresponding rapidity or profusion of vegetable growth and decomposition, so ought it to generate a corresponding proportion of Malaria, proportional also, it must be supposed in activity. But further, while it remains to be proved that the influence described in the foregoing paragraph is a real and efficient one in this case, I may continue to remark that the effect of cold is to produce, like that of heat, a predisposition to diseases; but of a far different nature, since these consist in active inflammations. This is the predisposition of spring; as biliary disease is that of autumn, or is supposed to be so. The cold of winter cannot therefore be esteemed a predisposing cause for the fevers of Malaria which occur in spring, though it may so modify the action of the poison as to cause it to produce what it does generate; simple intermittent, and not bilious or common remittent. Or, the variations of the temperature of spring can have no effect, as modes of heat, in predisposing to any modification of fever; so that whatever diversities then take place in the quality of the disease, must be the result of differences in the poison itself. And therefore, if the fever of Malaria is, in any one spring, more abundant and severe than in another, it is probable that the cause consists in a varying generation of that substance; in a difference in quantity, duration, extent, or activity.

And the same analogy may consequently be extended to the fever of autumn. There is actually more of the poison produced; and the quality of that may be worse, because vegetation and decomposition are more active. There are other phenomena also, noticed, partly in this essay, partly in the medical portion of this work, which prove, that, abstractedly from all effect of climate, the severity or quality of the resulting diseases is proportioned to what we must consider the production of Malaria. Of these, is the case of sugar ships, that of hemp, and that of certain fortified places, such as Havre; and of such is the case of the Pontine marshes, of Bresse, or of Forez. In some of these, the climate and its effects must pass for nothing; because the peculiarly severe consequences occur at all times alike; early in the year, or late; or at sea, where the climate cannot be reckoned; while in the others, and in a thousand similar cases in France and Italy, the climate and its effects are the same to the inhabitants over considerable tracts of country, but the peculiar severity and character of disease, single or epidemic, are confined to chosen spots, and those spots the very ones which we should judge, from their very characters, suited to produce an especially abundant or virulent Malaria.

I might easily extend this class of proofs; all leading to the inference that variations of the poison produce variations of the consequent fevers; while nothing can be stronger in this view, than those cases where the epidemic has been the consequence of propagation rather than production; the result of peculiar winds, or of the removal of trees; and where, the climate continuing the same, the results have differed, and, as is the fact, most seriously. It is therefore proved that every change of character, or every effect as to fever, epidemic or otherwise, is or may be independent of predisposition; while I know not that there is a single fact to prove the reverse. If there has been a hot season, or a moist one, which might be supposed a predisposing cause, we know that either of these alters the production of Malaria; but it has never been *proved* that such events affect the body as predisposing causes, far less as the real causes of such fevers. It is so assumed by physicians; and therefore, as is usual in physic, it is supposed to be proved, and becomes a dogma. But even granting this to be true to a certain extent, it must be considered a fact established, that the variations in fevers or periods of fevers, depend principally, or entirely, on variations of season as regulating the production of Malaria; while we do not require another cause, if this is adequate to all the effects.

Whatever may be the influence of heat on the body in modifying the characters of these disorders, it is an inquiry for the medical part of this work; and I may therefore proceed to observe, that as this is a question of temperature chiefly, it applies equally to climate and to season; and consequently, that an unusually hot season will, in our own country or in any other, be attended by an increase of Malaria, just as this poison is most destructive in the hottest climates; while it is amply confirmed by observation, that the precedence of a very hot summer is always followed, in autumn, and in every country, by an increase of the diseases produced by Malaria. Nor is it less familiar that intermittent is more prevalent in some years than in others; while there occur also sequences of years in which it abounds, to subside again for other similar intervals: these effects being independent of that increase or diminution which arises from changes in the soils of a given country, whether these have been meliorated by drainage, or deteriorated from opposite causes.

Now, while it is in spring especially that intermittents are produced, as the remittent is the produce of autumn chiefly, there are no observations of any value, whence we can deduce the nature of the present or previous season in which intermittent fever abounds in an unusual degree, however we may explain this fact as to remittents.

I allude here to the production, not to the transportation, of Malaria, because this latter cause of the diseases arising from this poison must always be local; as it is, for example, with respect to London, for the reasons assigned in the last chapter. Thus, although our seasons of intermittent are always seasons of east wind, this is a partial consequence; since, from analogous causes, the unhealthy season of Flanders is a season of southerly winds.

The observations of Sydenham and others are of no value on this point; but it may be conjectured that a mild winter, in which vegetation is not absolutely checked, ought to be succeeded by an unusual produce of this poison, and of intermittent; while the same results will probably follow from the sudden accession of a hot spring, attended by, or following, much moisture, and exciting an active and rapid vegetation. But be the particular actions what they may, it rarely happens in our own country, nor generally throughout Europe, where simple or original intermittent prevails, that it is produced in the quotidian or tertian forms at least, and as a new disease in a healthy subject, before the month of March, nor after the end of May; while this also is the period in which it is most easily re-excited in those with whom it is a habit, and in whom it may have become for a time dormant. That quartans are often produced in autumn, is one of those unexplained circumstances belonging to these singular disorders which here forms a species of exception.

With respect to remittents as connected with season, the grounds of judgment are somewhat different in appearance, though the principles are the same. Yet I must compress a part of the subject which in itself has occupied volumes. When, in one hand alone, the mere Malaria of Italy fills four large ones, to say nothing of a hundred other works, he who has but one for every thing, must be excused the brevity to which, on any particular subject, he is condemned.

The heat of a season or climate being admitted as the fundamental circumstance in producing and regulating the production of Malaria, it must be expected that, in any given country, fevers will be most numerous and severe as the summer heat has been most considerable and most long continued. But with this also, other circumstances combine to determine peculiar effects; and of these, one of the most common is, an autumnal reason of rain following upon long-continued heat, the same state of things preceding it, or even the occurrence of alternations of rain with heat, or strong and sudden contrasts of heat with cold; the former causes appearing to act solely on the production of the Malaria, while the last may possibly act as a secondary cause on the body itself, or on the people. It has also been observed, and too often to admit of any doubt as to the truth of the remark, that if an entire rainy summer has been succeeded by a hot one, that summer is a peculiarly unhealthy one, or becomes an epidemic season; the effect being similar to what happens from a rainy autumn succeeding a hot summer. And the solution of all these cases is sufficiently obvious; while it is easy also to see the analogy which they bear to the case of Africa, or of the tropical climates subjected to distinct seasons of rain, as formerly explained.

Such being the circumstances, a country like ours, which is but partially subject to fevers, may suffer to a greater extent, or disease may be produced where it had not formely appeared; or else, in certain parts, that slight endemic by which, for example, Lincolnshire or Essex is characterized may become an epidemic, and to us, a severe one, if slender as compared to Italy or France. And such has been the fact very generally in this present year; numerous villages in Lincolnshire, Essex, Sussex, Kent, and indeed almost everywhere, in which the autumn used formerly to pass over with a few insulated cases of fever, having been ravaged by epidemics which might well compare with those of many parts of France and Italy. And in the same manner, those fevers have appeared where they were formerly unknown, and even their possibility unsuspected; a fact which, in many places, seems to have excited considerable surprise, especially among those who had resorted to them as formerly, to seek for health. That all these have been cases of marsh fever, and not of typhus, as commonly supposed, is incontestable: while, proving that England is really exposed to Malaria very widely, an examination of these places so as to ascertain the exact cause, might become useful to those who are as yet ignorant of the nature of pernicious soils; as it might also convince the incredulous, of the hazards arising from a rivulet, a meadow, a horse pond, a trim canal, a coppice, or a gravel pit.

Thus also while, in ordinary seasons, such diseases are never wanting in the countries peculiarly subject to Malaria, constituting the endemic fevers of their insalubrious districts, that endemic becomes an epidemic in such peculiar cases;

forming those noted periods of mortality, of which so many have been recorded by authors, in various countries, both in ancient and modern times. I could not here pretend to enumerate these, numberless as they are; while, for particular purposes, I have elsewhere been obliged to point out a few cases: but, in as far as our own country is now capable of producing such epidemics, if the present year, 1826, and indeed the two preceding, are examples, as they are proofs of the cause, the state of Middleburgh in the present season, in a far other region, shows how a condition, in all cases sufficiently bad, may be aggravated by the precession and presence of an unusually hot summer.

On all this let me make one general remark. I have named Sydenham, and I desire to except him, as, in addition to his long established fame, his age was not one in which any great accuracy on such points could have been expected. But when we look at the medical reports of seasons as connected with the production of diseases, we find little or nothing but collections of loose observations, on winds, temperature, barometrical oscillations, rain, and whatever else, drawn perhaps into some vague parallel with the diseases of the same periods or years, but unclassified, unarranged, and unallotted. There is no reference to the general principles on which these ought, or might be supposed to act; and if the atmospheric phenomena are confounded in an indiscriminate mass, so are the diseases. We must work our way as best we can through inflammations, remittent fevers, contagious diseases, and much more, if indeed that can be done at all; while, had any classification of phenomena, and any distinctions in the characters of diseases been made, some useful knowledge, or something or other of fact might possibly have been acquired, whereas the whole is now an useless chaos. It is the random chemist who mixes every substance or test which he possesses, with the body to be examined, imagines that he has performed wonderful things, and leaves us, out of fifty idle experiments, to discover for ourselves, as we best can, what it is which bears on the question. Let us hope that some system, some accuracy of arrangement as well as of observation, will in time be adopted, and we may then expect to see whether at least any valuable information as to disease will be derived from these statistical records.

But other circumstances besides mere heat, or moisture, or vacillations of temperature, are often concerned in such cases; conspiring often with them, so as to produce epidemic seasons of peculiar severity, or otherwise modifying their effects in various ways. Respecting what belongs to the actual production or the propagation of Malaria, these particulars have been noticed in the former chapters; while it will suffice here, barely to remind the reader of them, in pointing out such facts as the long prevalence of an east wind in England, of a south-west in Flanders, and of a Scirocco in various parts of Italy; casual changes of the state of the soil, from inundations, earthquakes, breaches of the sea, or whatever else, and artificial operations of an analogous nature; to omit other collateral agencies which it would be superfluous to name again.

Besides these, a very few remarks of another nature will be sufficient as to what remains. Among such causes, a bad harvest, implying deficiency of food, or famine, is one, of no small note; the mode in which it acts being sufficiently obvious. Political circumstances acting on the minds of the people, is another, the destructive influence of which in many instances, can be traced in history: and where, as in the case of war under peculiar circumstances, these causes are united, often including also other evil influences too obvious to require mention, acting on the minds and bodies both, of the people, the consequences have been conspicuous in every age and country. To say through what details a country which is the seat of war is thus afflicted, or in what peculiar modes the armies themselves are exposed to causes aggravating the power of Malaria, would be to describe what a moment's consideration will suggest to every one.

As examples of such epidemic seasons, I may name the year 1691 in Holland; the pestilence, as it may be called, having been generated by the unusual heat of the summer, or by a more effectual vegetable decomposition: a case parallel, though in a far higher degree, to that of the present year 1826, already noticed. At Venice, 1535 was a remarkable season of epidemics, comparatively healthy as that city is, when its situation is considered; and such was the case at Copenhagen in 1652: the immediate cause, in both instances, having been the exposure and drying of land and mud which had generally been submerged. In 1707, Bagnaria in Tuscany experienced the same fate from the drying up of the canals; and according to Lanzoni, the great epidemic of Ferrara in 1728, was the produce of unusual autumnal rains in the preceding year, followed by a hot summer. In Normandy, at Bernieres, an unusual course of south-west winds, blowing across the marshes and conspiring with a hot summer, caused the epidemics of 1809 and 1811: and, to cut short these examples, I may conclude by simply naming the noted epidemic of Naples in 1806, prevailing chiefly at Ercola, that of Narbonne in 1801, and that of Pethivier in 1802, arising from different causes of the same nature. Of epidemic seasons following war, his tory, both ancient and modern, is full; and I may barely remind my readers of them; while the explanations now furnished will render those facts more interesting than they probably had been on a cursory view.

Some of the former considerations will explain the cases of noted epidemics when the character consists merely in an aggravation of the simple fever, and in a wider influence: but when, in such cases, the character of the epidemic is also peculiar, other collateral causes will be found to have acted. But not to enter into superfluous details, it will be apparent to medical readers, how a previously cold season followed by a hot one, may modify such fevers to an inflammatory tendency, and how similar effects may take place from the occurrence of cold winds or rains during such a season, or in the midst of such an epidemic state of disease. Hence, and from other causes, some of which are familiar, while others are still obscure, the characters of such epidemics vary in different seasons and in different places; while, barely to enumerate such recorded varieties, would not only be a tedious task, but is one which belongs rather to the proper history of the diseases themselves, than to the subject in hand, or to the history of Malaria.

If I have noticed the general period of commencement for intermittent among ourselves, I may also now point out what relates to that of remittent or summer fever. The beginning of this may generally be dated from the middle or end of August, rarely as early as the end of July; while it may be esteemed to terminate, as far as new attacks are concerned, before the middle or end of October. Thus the two months of middle summer and the four of middle winter are not only the freest from original attacks of the diseases of Malaria, but may, in this respect, be esteemed the healthiest portions of the year; this being further true, of the summer period, for all diseases.

All this however must be taken with great exceptions for particular seasons and particular situations. Thus, in the present summer, 1826, the remittent has appeared as early as the end of June; while in some extensive, and at the same time unhealthy, districts, such as Essex, for example, not only has it been severe, but has in some summers, and even very recently, commenced with the spring or the beginning of summer, as it does in parts of Italy, so as to occupy what, with us, is usually a period of mere intermittents, and thus to extend even to the end of autumn. And thus also if, in the present and the late hot summers, it has been unusually early as well as epidemic in some particular spots, it will always be found that in those, and in every season, its commencement is earlier, and its duration longer, than in others where the causes productive of Malaria are less conspicuous or extensive. And it is not less remarkable, that in the present season, many severe and original cases occurred as late as November, and even later, in particular spots: an event which is rare, even in the more insalubrious parts of France and Italy.

Other countries, as might be expected, are under the rule of periods somewhat different; while if, in these, the season of Malaria is generally of longer duration, in proportion to the heat of the climate, it sometimes also happens, as it does in the rare cases just noticed in our own, that the vernal period of disease, or that which may be considered the proper season of intermittents, which, however, as vernal disorders, are comparatively rare in those climates, runs into the autumnal or remittent season, so as to leave no portion of the whole summer, even from March to November, free; a fact which has occurred repeatedly in some of the peculiarly insalubrious districts of France. In Italy, as a general rule, the Malaria prevails from the solstice to the equinox; but it very often also appears as early as May, while in the Pontine marshes, it continues even to the end of October, or later; the effects being augmented by the rains of September and October. The same varying rules may be applied to France and Holland: but it is unnecessary to protract this detail as to the several countries of the world; since a mere knowledge of any specific climate and country is commonly sufficient as a ground of judgment, because the same general rules govern all places.

I may as well however notice one supposed fact here, in addition, since I could not find a much more appropriate place for it. This is the influence of the moon, real or imaginary, in the production of Malaria, or of fevers; since it does not seem to be well ascertained which is the real fact. The evidences to be found in Jackson, Lind, and Balfour, but chiefly in the latter, seem difficult to doubt; while if the effects depend on the increased production of Malaria, in the oriental regions where this circumstance particularly occurs, it has been explained by the higher state of the tides at the new and full moons, and by the consequent and subsequent exposure of a larger space of wet mud. But I must refer to those authors for such proofs and details as would here exceed the space which I can allow for facts of a doubtful nature and for disputed opinions.

I must pass to the subject of mere climate; on which, if a volume might be written from the works of others, it would be a volume of little value, as a few simple principles will include all which the subject contains, of any interest.

The basis of the whole question is indeed comprised in the few leading facts which have been already laid down; while season and climate are, in reality, as to this subject, almost interchangeable terms: so that by referring to them, it will always (with some yet unexplained exceptions) be easy to determine why any specific climate is productive of Malaria and its diseases, and also *a priori*, whether it is so or not.

Marshy or swampy land, or a vegetation and subsequent decomposition taking place in a soil alternately wet and dry, or intermediate between moisture and dryness, is, as has been fully shown, the general or most common basis of the whole evil, if it is not the sole and exclusive source of the diseases in question: and it is indifferent under what precise circumstances or forms of soil and site this essential fact exists; as the space or extent seems equally indifferent, further than as relates to the extent or range of the evil.

The next essential circumstance is, an active vegetation followed by a rapid decomposition; and as this is always proportioned to the temperature, directly, moisture being presumed to be necessarily present, it is thence easy to compute, with sufficient precision for this view, where we are to expect Malaria and its diseases. Hence the latitude alone proves nothing; since, in elevated intertropical situations, the tendency of vegetable death is, as in cold climates, to produce peat, as I formerly showed, rather than to fall into that more perfect decomposition which seems necessary to the generation of Malaria.

I ought here also to notice one specific fact appertaining especially to the tropical climates, which is a very principal cause of their insalubrity, or of their power in producing fevers;

though it has necessarily already come under review as connected with the state of the soil, and therefore requires mention now, merely for the sake of order. This is that peculiar division of seasons which is marked by a decided interval of rain associated to one of entire dryness: the monsoon of India, the rainy season of Western Africa. How this acts, I need not repeat: but let it happen where it may, it will always indicate an unhealthy region, on which we may calculate without fear of error. And in as far as it is a question of season as to such climates, it is one on which there is no ignorance, at least among the natives of such countries: if war and colonization have not always conducted themselves under such circumstances, with all the prudence and all the appearance of knowledge that might have been wished.

If, in intertropical climates, a moist atmosphere, or that hot fog, if I may use such a term, so noted in some parts of Africa, is peculiarly favourable to the production of the diseases of Malaria, the cause may partly consist in the greater activity, both of vegetation and decomposition, partly in a conducting, or perhaps a chemical power in such an atmosphere, peculiarly suited to the action of the poison, or in a greater facility of propagation; and partly also, it is possible, in the pernicious influence which such an atmosphere exerts on the body: rendering it susceptible of this poison, or ill fitted to resist it, or else prepared to suffer seriously from the diseases which it produces.

It is not easy to avoid making a remark here, in which humanity at least is concerned, and in which it is difficult to conceive that justice and sound policy do not unite with humanity; though for a remark of this nature in such a work, I must both apologize, and submit to such criticism as may accrue. As a question of state policy, I am fully aware of the difficulties and the objections; and not unaware also what side, under a sentimental philanthropy, certain advocates of humanity are likely to take.

To men of ordinary reasoning powers and plain sense, (being those from whom I have borrowed this remark), it appears extraordinary that our tropical African colonization should be carried on by innocent and honest subjects, while the finest and healthiest climates in our possession are set apart for the guilty, and allotted as the means of punishment. If it be true, as is asserted, that for every negro gained to our new African civilization, an European life is paid, the purchase is made on terms sufficiently severe: but putting this out of the question, the naval officers who have been employed in this service, cannot see without regret, the loss of valuable men which has arisen from the business of cutting wood on these pestiferous shores, while reflecting also that such work might be performed by men of a far different value, and who have forfeited their lives to the community. Needs it be said that hundreds of efficient seamen, or of innocent men, have been sacrificed on duties which, even to their own conviction, almost imply a sentence of death, and on duties that might be performed by persons of infinitely less value to society, of even far less pecuniary value to the state; as they might be by men on whom society and the state alike hold claims, in return for the indulgence which they have received from justice.

It is not easy to see what reasonable blame could attach to our criminal law, if the forfeit of life were commuted into a sentence of labour on the African coast, instead of transportation to New Holland, at least in specific cases; and if the duties in question must be executed, there can surely be no hesitation respecting the comparative justice, any more than the humanity, as these are now carried on; since it is in vain to say, as has been said, that a seaman is a free agent in this case, when he cannot decline obedience to his orders, though orders of peace and not of war. Though he has entered freely, and has calculated on many labours and hazards, he has not calculated on sickness and fevers beyond the ordinary average of human events; nor foreseen that it would be his lot to labour in African swamps with an inglorious death before his eyes, too often to lose his life for a cask of water or a bundle of wood.

Yet thus much, forming the ordinary service of ships, is perhaps unavoidable; and must be endured. But the cutting of wood for other service than the immediate wants of the ship, is not in the course of duty; and the question is, whether it should be allotted to innocent and valuable men, either in a view of economy or of humanity. It is not *my* opinion however, but it is that of the officers whom I quote, that this is a duty which might be performed by convicts, easily and advantageously. That there is a modern philanthropy which would raise its voice against such an attempt, is probable: yet the work must be executed by some one; and the naval commander who feels that he is condemning to death those who have accompanied him before the dangers of the sea and the enemy, by the order which commands a boat on shore to cut timber in an African swamp, will not be convinced that the present policy is either humane, or just, or expedient; however unable an individual may be to offer the remonstrances which some of the most respected of this class have here requested me to make for them.

Further, and to proceed to our proper subjects, there may be many local causes in such, as in all climates, capable of aggravating or determining the action of this poison; such as a confined valley unfavourable to ventilation, or woods similarly concentrating its action, or forms in the land, or winds of a peculiar direction, fitted to carry its energies to some given point; circumstances which have been fully detailed in the last chapter, and which it now, can only be necessary to allude to in this place.

But in reality, many of these circumstances are in themselves peculiarly regulated by climate: or if a warm climate acts in the production of fevers, through its heat, its moisture, and its more rapid vegetation, so does it by means of the unusual multitude and density of its trees, by the peculiar combinations of these with its rivers or its estuaries, and by other circumstances of a local nature, which it cannot be necessary to recal to the minds of those who possess even the slightest geographical knowledge.

On this subject in general, there is one remark worth making; although, as derived from the doctrine of final causes, it may not at the present day be very generally acceptable. It is one of the apparent laws of nature, that the habitable surface of the earth should be gradually extended by the action of causes which geology demonstrates; while, from the same law, it follows that the new lands are, in a great ratio, more productive than the old, on a comparison of areas; with exceptions, of course, for which there is no room, as there is no necessity, in this place. These are the alluvial plains, constituting the most valuable and populous tracts on the surface of the globe: and their enormous extent can be estimated by every geographer, as geology demonstrates their certain and progressive increase.

It would be abundantly easy for any geologist to point out, over the entire world, what new lands have been formed since the mountains first arose out of the waters; though the computation would surprise those who have never considered this subject: as it would not be very difficult to foretel what is yet to happen in this respect;

where new lands are to be formed, and where and how the old are to increase, extending the habitable surface of the globe for future and increasing races of men: and with that also, producing lands a thousand times more fertile than those which Nature first formed, so as to augment, not by simple addition, but in a ratio which may be considered geometrical, the powers of the earth in providing for the, unfortunately, still more rapid geometrical increase of population.

Now in the hot climates in particular, from the extraordinary vigour of vegetation, as well as, in some measure, from the moral condition and habits of the people, these tracts are productive of a population, even to excess and incumbrance; and it is in these very lands, as if for the purpose of a constant check, that there have been implanted the steady and ever-active seeds of disease, operating as a perpetual relief to what would otherwise perhaps find no relief but in the greater misery of famine. If this evil also operates when it is not similarly productive of good, it is no more than happens throughout the whole system of nature, where general laws have been established for the production of general effects.

I might now proceed to a detailed statement of the climates in which Malaria and its diseases prevail most conspiciously; but almost every enlightened reader can here form such a one for himself; and I could but repeat what, perhaps, every one can conjecture. It will be better to leave this subject to the reflections and researches of those who may be interested in it; while it will be more advantageous to enumerate, as an illustration rather than a history of Malaria in its relations to climate and country, a few examples of what may be called its geography.

I grieve to say that this must be very imperfect, as much perhaps from want of correct information as from want of space. I have already hinted that there is no work more wanted in medical statistics than a geography of Malaria; a work which, in Europe at least, seems of pressing urgency, from the great increase of travelling, as well as of migrating residents abroad, and from the mass of misery, added also to a considerable mortality, which results from their ignorance, not merely of this necessary geography, but of the simple fact itself, or of the leading principles by which the production of Malaria and its diseases is regulated. Everywhere in France and in Italy, we may find whole families suffering under diseases which are often incurable, produced by an incautious choice of residence, or returning home with ruined health, from the very lands where they went to seek both health and happiness; objects of misery and suffering as long as life shall last.

If there is not much written on this subject, there is however something; and among what is recorded, I may point out an excellent statistical table of Malaria drawn up by Captain Smyth, for Sicily, extremely valuable if accurate, and apparently extremely accurate. And it is especially valuable because of its details; since, after all, these are what are required. To be wanting in these particulars, is the fault of the Italian writers in general, as it is of the French; since, from the whole united, we could not derive such a statement as that to which I have just alluded.

CHAPTER IX.

On the Geography of Malaria.

It must be plain that to detail the geography of Malaria for the whole world, would be little else than to write a general grammar of geography; and that to do this, even for Europe alone, would be to produce no small work. What the numerous and voluminous writers of Italy have done for their own country merely, on this subject, will prove that I do not exaggerate on this matter. My own sketch must necessarily be a very slender, and also a very confined one: and even indeed had I the space to make it larger, I should be unable to procure the requisite information, since it does not exist.

Respecting the three great divisions of the globe, there is nothing whatever to be discovered beyond the most casual and dispersed notices, to be found, rather by good fortune than industry, in the writings of travellers: and with regard to Europe indeed, there is the same blank, with the exception of France and Italy: since even Holland has not chosen to inform us on this subject;

deeming perhaps that the whole might be comprised in one word. And though Italian writers abound on the subject of Malaria in all its relations, they seem generally to exhaust themselves in speculations and theories rather than facts; or, if noticing sites and places, it is to discuss to weariness some spot so notorious as to demand no further illustration, and to neglect those details which are wanted for use, and which alone ought to form the plan of such a work. Thus also have I been disappointed in Monfalcon; who, appearing as if he had intended to give us the entire geography of French Malaria, has confined himself to a few broad details on some chosen places; leaving the far greater part of his subject untouched, and, as to any useful purpose, being commonly superficial, or more properly, general, in what he has described.

It is impossible to write without materials; and I, therefore, can pretend but to give some very scattered notices on this subject, in which, moreover, I must almost limit myself to Europe. I had indeed intended to suppress a chapter so extremely deficient and unsatisfactory as this must be: yet when I recollect that whatever I may point out will be a warning to travellers, at least as far as it extends, and when I also reflect, Such portions of land, bounding or skirting rivers, to whatever extent, are however most pernicious, whether situated inland, or on the sea shores, when they include marshes, whether fresh or salt, when they are subject to inundation, like the vallies of Cochinchina, Ava, and Egypt, when they contain wet woods or jungles, and above all, elephant and bamboo jungles, or when, on the sea line, protruding far beneath the influence of the tide, they give birth to mangrove and similar forests alternately occupied and deserted by the sea.

This division of physical geography includes, in reality, the far larger portion, all over the world, of that local geography which is most noted for its pernicious qualities; while exceptions will be found in such open plains as many of those in South America; where, independently of a form of land less subject to a pernicious moisture, or in which that is in a great measure exhausted by a peculiar vegetation, open, if luxuriant, and free of those close and thick woods which are so favourable to the production of this poison, there is not that peculiar alternation of rain with heat, which, in Africa and Asia, appear to be no less aiding in the same effect.

Next to this particular division of physical geography, I may name those places or wide vallies, abounding in many parts of the world, and very conspicuous in France, where large rivers do not exist, however alluvial they may often be, but where, from an imperfect drainage, water accumulates, so as to give rise, as in Hungary, in the Lyonnais, and elsewhere, to collections of lakes or pools, or to marshy and meadow land, or to wet woods.

As the margins of lakes are sources of Malaria, the existence of such accumulations of water, constitutes another department of natural geography which takes no small share in this subject; while it is plain that the essential reasoning is the same as that which is applied to sea shores. Of such pestiferous tracts, the Italian lakes and those of America furnish noted examples on all scales; while respecting the whole, it will be, in general, sufficient for any one to examine a good map, to deduce those conclusions which I could not here specify without occupying much more space than would be convenient.

Such are the leading divisions in physical geography which may form our guides as to this judgment; and any one who is acquainted with that great department of natural history, little attended to except by geologists and geographers, would find but little difficulty in constructing for himself a map of the Malaria of the world, as far as its natural geography is known. What else belongs to this subject in a general view, is commonly too partial or accidental to admit of a place under this head; nor need I now repeat all the modifications of land which, incapable of being thus classified, are sources of Malaria; since the rules respecting these have been sufficiently indicated in a former chapter.

But if I have mentioned a map of Malaria, I know of few statistical works which would now be more useful than such a one for the world at large; as far at least as the civilized, and commercial or colonizing nations have extended their connections with it: while it indeed forms a branch of statistics and economy as to individual countries, which it is disgraceful to the European nations to have so long neglected. It is, in reality, a department in political economy which it is incumbent on every government to investigate and make known; deeply as it is involved with many of the fundamental principles of state policy, as these relate to the public health and industry, and deeply also as it concerns the great question of war, colonization, and commerce. Executed for Europe alone, it would, as I have more than once suggested, be invaluable to mere travellers; and I can only regret that my information does not allow me to produce what indeed, even if executed, could not have been appended to a work of this nature. Let me only hope that what I here hint may stimulate some of the physicians, who swarm all over Europe as residents and travellers, to commence a task, the neglect of which is to them in particular, disreputable: and if they wish for an example, let them follow the road so well marked out by Captain Smyth in his accounts of Sicily and Sardinia. Were there no other proofs of the utility of this knowledge, he would himself furnish an incontrovertible one; since by this alone he preserved his own health and that of his people during the many years that he was engaged in the survey of the Mediterranean; occupied incessantly in places of the most pestiferous nature, and in every one of them; as this sketch, in as far as it depends on his communications, will abundantly testify.

To commence therefore with the sea coasts of Italy, since it is indifferent where I begin, if between Nice and Pisa there are occasionally interspersed some unhealthy spots, such as, near Vintimiglia, Oneglia, Albenga, Spezia, and Massa, it is not till we arrive at Pisa, or rather at Lucca, that this highly insalubrious region may be said to commence. The whole plain between this city and Leghorn, as far at least as it approaches the sea, is highly pernicious, on the testimony of Italian authors, though it is the region watered by the almost classical Arno: and if Florence does escape that plague to a great degree, it is, on the same evidence, far from being the very healthy neighbourhood which it is commonly represented. But it is at Rosignano, or at the mouth of the Cecina, that we must fix the real boundary, in this direction, of one of the most notoriously pestiferous tracts of Italy. Here begins the dreadful and dreaded Maremma of Tuscany; terminating about Montalto, but continued through the dominions of the church, so as to include the terrific Pontine marshes, as far as Terracina and beyond it.

Inland, the extent of this region is also considerable; since, at Sienna itself, the annual mortality is one in ten, and even without epidemic fevers, or exclusive of them. It occupies an even wider space within the Roman states; since it surrounds the lake of Bolsena, and, generally speaking, may be said to reach to the foot of the Apennine; while the elevated position of Aquapendente and of other towns and villages, demonstrates the conviction long ago felt repecting its insalubrity. There are not many parts of Italy, in fact, more marked by this pestiferous celebrity; since, from the most ancient times, the Maremma of Rome has been even of worse repute than that of Tuscany; while the Pontine marshes, I need scarcely repeat, are proverbial; being almost depopulated, in some parts indeed an absolute desert, and scarcely also to be passed, even in the most rapid manner, in the summer season, without imminent hazard.

Of Rome itself I need not again speak: and if the town af Naples escapes this scourge, it is not so with regard to the sea shore, even from Gaeta; since many parts are utterly uninhabitable in the summer. Nor is much of the surrounding interior country exempt, in spite of its attractive name Felice: since the aspect of the inhabitants of Mondragone alone, is sufficient to forewarn, if not to terrify him who expects that the rich woods and cultivation of the Campagna are a warrant for its salubrity, any more than are the refreshing breezes or the ancient fame of Puzzuoli and Baiæ. Many of the most highly cultivated and woody parts are in fact the most unwholesome; and thus Caserta, Agnano, and Cumæ may rank with Misenum and Puzzuoli. What Pæstum is, on another quarter, even the most incautious travellers now know but too well; and dearly have many paid for the idle curiosity which prompted them to seek a reputation for taste in exploring its classical ruins. But the whole of this shore from Salerno even to the island of Piana, and far within the land, is alike pestiferous; nor does it cease to be so until the mountains approach the shore far to the southward; the same plague reappearing at Policastro, in the gulf of St. Eufemia, at Nicastro and elsewhere; and skirting the entire coast from Tropea even to Cape Spartivento and beyond it.

Hence, along the eastern side of this promontory, the whole Calabrian coast is, if that be possible, even more poisonous; the seat of fevers of the worst kind, wherever a river exists or a plain is to be found, and escaping only where the high land chances to meet the sea. Thus the whole gulf of Tarento, especially surrounded by wide alluvial plains and giving passage to many rivers, comprises a district scarcely exceeded for unhealthiness by any portion of Italy; Gravina, at the foot of the hills, hardly terminating the range of its influence in this direction. Such also is the horrible celebrity of Otranto, Brindisi, and Monopoli, that it is almost superfluous to name them; but, in fact, this is the character of the whole

Adriatic shore here, up to the gulf of Manfredonia; while from the bay in particular, the pestiferous region extends almost to the very foot of the Apennine, so as to include, with that which reaches from the gulf of Taranto on the other side, the largest tract of unhealthy land in the south of Italy.

Hence to Ancona, the entire coast is but a repetition of the same circumstances; a hundred rivers flowing down from the mountains, and each forming its little poisonous valley or plain; while the few exceptions that occur, happen where some elevated point on the shore, or a hill in the interior, enables the breeze to divert or blow off that poison which is generated all around. Beyond this, and even as far as Trieste itself, there is scarcely even this exception along the whole shore; any further than as Venice chooses to claim that exemption which I formerly inquired of.

But if there are tracts along this division of the shore of Italy more insalubrious than others, I need not here separate the mouths of the Po and the Adige, or the notorious gulf of Comacchio from the interior country to which they belong; from that extensive plain lying between the Alps and the Apennine, of which so large a portion is noted for its bad air. Here, ten great rivers descend from the Alps, and twelve from the Apennine; joining with four hundred and fifty smaller streams, to propel towards the sea that land which they have brought down; thus extending the shore, and producing marshes and flats or lagunes, such that, in many places, the rivers are almost reticulated by inosculation; leaving, in consequence, in many tracts, an intermixture where the land and water compete for superiority. This is that geological process to which I formerly alluded, by which can be partly explained the great increase of Malaria in Italy in modern times; and, very particularly, in this division of the country, the palpably accelerating progress of disease, together with the extraordinary difference between the experience of modern times and the reports of the classical ones, as to the salubrity of the coast, even from Catolica to Aquileia.

If the increased insalubrity of the sea shores on the great plan of Italy is accounted for by this increase of those coasts, by this immense production of a new territory, every atom almost of which is the parent of a new and extending poison, and of which increase there is abundant evidence in many more ways than the long exclusion of Ravenna from the sea, so it is not difficult to explain the similar increase in the interior, dependent on the same causes acting in conjuction with the operations belonging to agriculture. In every similar case of powerful rivers traversing a fertile plain, embankments become necessary, as I have formerly shown; and, every year, while the height of these must be increased, so must they be carried to a higher point on the stream; while, the including lands become more difficult to drain, and the entire region of marshy or wet land is extended. It is thus, in the district in question, that the Po is now, over a large tract, literally running on the summit of a wall, threatening even other dangers than a further increase of that bad health which it is producing: both circumstances united having led to a design of letting it loose to find a new channel for itself, which, had the government of Italy continued in the same enlightened and powerful hands long enough, would doubtless have been carried into execution.

To this cause, over Lombardy, and generally throughout this great plain, must be added the cultivation of rice, or, compared to the classical times, a general change as to the agriculture in gencral and the growth of woods; comprising details as to individual spots, for which I must refer to Filiasi and others, for want of space to treat such a subject minutely. But I may remark generally, that wherever, to the north of the Apennine, the same cultivation and the same lands do not produce the same extent of bad health as to the southward of these hills, it must be attributed to the effects of the cold north winds from the Alps, and to the screen which the former range affords against the pernicious south winds; while to the effect of those in a great measure, further checked and retained also by these mountains, must be mainly attributed the unusually pestiferous qualities of the Roman Maremma.

Having premised these explanatory particulars, I may, in a general way, divide the plain into three parts, namely from Turin to Milan, from Milan to Mantua, and from the latter city to the sea or the lagunes. This last is the proper marshy district; and it is almost superfluous to name that tract especially called the Mantuan, since the pestiferous nature of Mantua, Bologna, Ferrara, and many more places, has been long sufficiently notorious to scare away even those who affect to hold Malaria in contempt. If the Milanese is less widely or severely unhealthy, it is still but too well known for the Malaria of its rice grounds; while all along the Po, even to Pavia and beyond it, and in the course of the Ticino as far as that extremity of the lake of Como, the same insalubrity prevails in the summer season.

But I dare not give more space to this part of my subject; which indeed could not be effectually treated, except by such a statistical catalogue of towns as Captain Smyth has produced for Sicily. This must suffice for the pure, the bright, the fragrant, the classical air of Italy, the paradise of Europe; to such a pest house are its blue skies the canopy, and where its bright suns hold out the promise of life and joy, it is but to inflict misery and death. To him who knows what this land is, the sweetest breeze of summer is attended by an unavoidable sense of fear; and he who, in the language of the poets, wooes the balmy zephyr of the evening, finds death in its blandishments.

Such is Malaria. We avoid the infection of the hospital, we may shun the city of the plague, we can shelter ourselves from the pestilence before which thousands are falling around us. But who can hide himself from the universal atmosphere, or refuse to breathe the wide air, though conscious that every inspiration is a draught of pernicious ones being thus dispersed, and occurring chiefly near Messina, and thence to Patti, about Cape Orlando, St. Marco, Tassa, Termini, and Castel-a-mare; with which I shall here terminate this brief notice.

If Sardinia is even a more notedly pestiferous country than Sicily, I understand that the officer whom I have just named is about to produce a work on that island also, in which the details of the insalubrious places will be given in the same manner as for Sicily. In the mean time I may remark from him, that the entire eastern shore from St. Pilamo even to the Straits, is but the boundary of a belt of pernicious land which reaches to the foot of the mountains; while the same also is nearly true of the whole western and southern shores, even from Cagliari to the Cape of Algher. Here, the descent of the mountains to the sea produces a salubrious tract as far as Cape Falcone; but the pestiferous country re-appears within the bay, occupying the whole flat territory about Sassari, and extending far up the country along the course of the Goccomo. Thus, in fact, almost the whole of Sardinia, except in the moutainous tracts, is subject to this plague; while, whether from peculiarity in the climate, in the relative positions of the mountains and the low lands, or in the effects of the winds, added perhaps also to the habits of the people, its effects appear to be almost everywhere unusually severe or virulent.

The entire eastern side of Corsica, from the straits to Bastia, possesses the same characters, though the belt of land is narrower; while if Bastia itself is insalubrious, St. Fiorenzo is almost uninhabitable from the same cause. On the western side, the unhealthy spots are separated by ridges of hilly land, occupying, as usual, the vallies; and among them, the most conspicuous are the gulfs of Calvi, Porto, Sagone, and Campo Moro, together with that of Ajaccio and the town itself. How severely the French garrisons have at different times suffered in this island, and particularly at St. Fiorenzo, I had formerly occasion to notice.

From Porto Ferrajo to Porto Longone in Elba, there is also a considerable tract of Malaria: and I had formerly occasion to speak of Minorca as far as it related to Port Mahon, while I may here add the western side of this island about Ciudadela as not less notorious for its insalubrity. In Majorca, the chief pernicious district is that which surrounds Alcudia, extending to a considerable distance inland; while in Ivica, the unhealthy region includes the town of Ivica itself and the surrounding tract for many miles.

With respect to Greece, I am compelled to limit myself entirely to the coasts, and to Captain Smyth's observations, having had little success in my researches among travellers, even when medical ones; there seeming to have been a sort of general agreement to neglect this important branch of the natural history of those countries, though the fate of many of our travellers, or of our speculators on Greek liberty, and one noted instance in particular, might have been supposed sufficient to excite an interest in it, even if our occupancy of one portion of this famed land had not. If we commence from Trieste, we may at once condemn the whole flat lands of Istria, from Capo d' Istria to Pola; where, to travellers, the beauty of the scenery in many places, is ill attained through the hazards which must be encountered, and where, as in Italy, all the dangers from all the banditti that ever lived, are but as a feather against those which scarcely any precaution can guard against in summer. The mountainous coast of Croatia seems to be exempt, as is generally true everywhere here, except where some occasional valley of a peculiar character occurs: and if among the numerous islands of this shore, there are many not subject to the Malaria, we may be sure that it is where there is no water, as is here frequently the case. But Veglia is not exempt, nor the coast from Nona to Sebenico and Spalatro, nor the islands of Lesina, Corsola, and Melida, and the peninsula of Sarioncello: while nearly the whole of the Dalmatian and Albanian shores, including the mouths of the Narenta, Ragusa, and Cattaro, and then extending uninterruptedly even to Valona, is one entire tract of fevers, occupying also a very considerable breadth towards the interior country.

If this pestiferous belt is here interrupted for a space by high land, it recommences at Panormo, extending southwards along the coast, so as, almost everywhere, to surround even the gulf of Lepanto; of variable breadth, and that breadth always regulated, as usual, by the positions of the mountains, or by that form of land to which it is owing that entire Greece is so much less exposed to this plague than it would otherwise be. Hence it is, in reality, that the topography of the shores of that country as to this subject, is nearly also the topography of the entire shores while by pointing out in a few places its inland extent, I shall afford a rule for judging of others, where, either from ignorance or the desire capable of shutting them to the truth, he should have so persevered in wrong, is nearly incredible. Whether Lord Byron would have died of that fever, under proper treatment, He alone to whom the book of Fate lies open, knows: but while many must feel that indignation, as well as regret, which some would also express under the same conviction, it is difficult at least not to think, even under the most dispassionate view of the circumstances, that the death of this lamented personage was caused by the ignorance of his physician; if ever that act was committed by physic.

To return to the Morea. Commencing at Gastouni, we find the whole plain which includes the Alpheus and the other rivers of this district, equally unwholesome, and to a wide extent; while, comparatively skirting the shore further to the southward, it is sooner terminated by the mountains in this direction. Thus the Malaria attends the rivers which flow into the gulfs of Koron and Kolokythnia; penetrating many miles along these vallies, and re-appearing at Argos and at Napoli di Romania, as our own countrymen have discovered; while, moreover, it occurs almost every where along the promontory and round the eastern shore, as far as Corinth and

Megara; extending even near to Athens, nor omitting Ægina in this quarter. The ill fame of the plain of Marathon has now also become familiar, as is that of the opposed shores of Negropont; and if both coasts of the channel of Talanda are insalubrious, that which reaches from Thebes as far as to Zeitoun, penetrates into the interior, along the Salambria and the Gaurios, even towards the declivities of Parnassus, maintaining its pernicious character through this whole extent.

As to the whole of this part of Greece, and indeed of that country generally, I may make the same observation as I did respecting Italy, namely, that although what I formerly remarked as to the drainages of the ancients and the fables of Hercules, and what may be found in the writings ascribed to Hippocrates, testify that such diseases existed, and that their causes were well understood, yet there has probably been a great increase of insalubrity since the classical times, from causes similar to those which I then pointed out. Of these, the chief must be sought in geological changes of the surface, produced by the action of rivers and of the sea, and giving rise to new and pestilential alluvial lands; as also in new modes of agriculture or of rural economy at large;

those comprising, principally, the cultivation of rice and the management of woods: while, as to this particular country, when compared with Italy through the same period of time, it is easy to see that much may be attributed to the consequences of misgovernment; to diminished capital, industry, and perhaps also knowledge, or, generally, to diminished care and improvement as far as the lands are concerned.

The former great cause, unceasing, if slow, is that indeed in which the whole world is implicated; nor is it difficult to see, as I formerly explained, that while the mountains shall flow to the sea, increasing the plains, and, in creating new lands, providing, in an increase of fertility as well as of extent, for an augmenting population, so must the augmentation of insalubrity and the increase of diseases accompany these changes. And while, in such cases, increase of industry and attention is required to meet the evil, it is the misfortune of Greece, as it has been of many other declining or fallen states, to have suffered a loss or diminution of both, or of that at least which alone could have maintained and stimulated them, from the effects of its unhappy and lamentable political condition. Did any visionary geologist thus choose to speculate on the day when the mountains shall be levelled with the plains beneath, an event which, in a period beyond the range of calculation, must happen should our globe endure thus long, he must also be prepared to view that previous period when, whatever vegetation or whatever animals may possess the marshes and plains of that world, it will scarcely be man; since, long before this, he will have been driven from them, as he has been from the Pontine marshes, by that plague which Nature is even now daily preparing in silence to keep his unmanageable increase within bounds.

To return to Larissa, we may include the whole plain of Thessaly within the range of Grecian Malaria; while its history may also teach us what must be expected when, at some far distant day, as I once before suggested, the destruction of the bed of the St. Lawrence from Niagara backwards, shall, if it does not similarly drain Lake Erie, expose at least a large portion of the bottom of that lake, and probably induce many other great changes on the surrounding country. From Larissa, the range of Olympus ensures the salubrity of a considerable space along this shore; but the Oleander, among other vegetable beauties, the infallible warning of Malaria wherever it occurs, soon begins to tell the tale of that tract which, reaching along this shore to Salonika, and beyond it to Panomi, occupies the Venetiko as far as Grevno, and extends so widely throughout all these vallies and plains of Macedonia.

From Erissos to Cavallo, and all through the gulf of Contessa, there is a similar tract of unhealthy land: and if, beyond this, my information respecting the coasts of the Grecian mainland draws to a close, I can still point out the coast, and also the valley for a long space, which extends from Enos to Ipsala and towards Adrianople.

In the islands of the Archipelago, the entire of Lemnos, and a great portion of Imbros, are similarly pernicious; as is all that part of Mitylene which surrounds the bay, together with the eastern side of Scio, almost the whole of Naxos, a part of Cerigo, and the whole of Milo and Paros: the latter island being peculiarly pestiferous, as I formerly had occasion to remark when speaking of the fate of the Russian army at Naussa. In Candia, there are various unhealthy tracts; namely, at Candia itself; at Sudo, Port Stauro, and Settia; and thus, certain parts of Cyprus, particularly near Famagusta, are among the most notoriously poisonous climates in the Mediterranean, as Dr. Clarke has remarked; though paying less attention to this subject than, from his personal sufferings united to his medical knowledge might have been expected.

I must pass over the African shore of this sea, where, nevertheless, there occur many unhealthy spots; as is the case between Susa and Bona: partly because my information is imperfect, and partly because it is less interesting to general readers than the countries of Europe which they may chance to visit. Thus I must proceed to the shores of Spain; respecting which however, my information is very scanty, and, what is worse, incapable, at present, of being augmented. Tracing from the Pyrenees, there is an insalubrious tract near the Gulf of Rosas and including Gerona, of no inconsiderable extent; while, beyond the mountains, a similar one occurs at Tosa and St. F. de Guixolos. That Barcelona is not the very healthy place which it was once thought, has been recently proved; but the first united and extensive territory of Malaria succeeding this, is that which commences to the southward of Tarragona, occupying the mouths of the Ebro, and extending many miles along its course into the interior; while it ranges the whole shore, beyond Cape St. Martin to Benisa. This is the rich, the fertile, the envied Valencia; a province in which this plague is, unfortunately, not limited to the sea coast, since it occupies the entire country, wherever that is flat and fertile: extending to Segorbe in one part, and similarly along the Xucar, and, from Valencia, far along the course of the Guadalaviar.

To pass over some other spots of less note, Murcia is the center of another similarly pestilential tract, reaching nearly from Alicante to beyond Cartagena; this latter district being the rival of the Pontine marshes, and the grave of those who, even for a few months, nay, often during a few days, are condemned to labour in its destructive vicinity. And if, still further westward, I have reason to believe that very little of this coast is exempt, even to the mountains of the interior, I can only point out, as especially notorious, the country round Aguilas, the vallies extending inwards from Almeria, Adra, and Salobreno, and the flat lands from St. Roque, as they hem in Gibraltar; itself placed beyond the reach of this plague, by its elevation, united, probably, to its particular ventilation.

The Atlantic shores of Spain, henceforward, present one continuous tract of pestilential land, which, if comparatively narrow from Gibraltar to

Trafalgar, soon enlarges so as to reach even to Medina Sidonia: while, if Cadiz escapes much of the evil, it is only from holding a position which, if, sometimes, and in some seasons, comparatively secure, is not protected from those winds at least, which blow from the marshes of Chiclana to the southward and eastward. Here indeed the easterly winds deserve the reputation which I formerly attempted to adjust; nor would it now be difficult to see over the territory which I have already passed in this cursory manner, how this entire point might be determined, by a due comparison of the localities of places generating Malaria and of those receiving it, under the influence of this wind or any other: while a similar investigation of the geography and of the facts which relate to the existence of disease, on the one hand, and to its remote probable causes, on the other, compared with the results as they follow certain winds, would confirm, over every part of the Mediterranean, and indeed of the world generally, the view which I formerly attempted to establish. With respect to Cadiz, I ought however to remark, that it has been the subject of a peculiar controversy as to this question: a dispute, the causes of which are similar to those in which the West Indies, Gibraltar, and New York have been involved, and into which, of course, I dare not enter: while not doubting, that whatever may have been the celebrated "yellow fever," this city is subject to the influence which I have been describing, though, assuredly, in a less degree than if it had not that protection which it derives from its insulated position.

But the whole of this portion of Andalusia is more or less insalubrious, and often very highly so; while if Arcos and Seville are included within this boundary, so it reaches to Lagos, or almost to Cape St. Vincent; extending also along the Guadiana, over the whole plain, to Badajos and Merida, and much further indeed than my imperfect knowledge enables me to pursue it: though I may remark that where that river disappears to form great marshes at Alcaza, it produces a particularly unhealthy district.

I must here indeed cut short this brief notice on Spain, at least for this part; since I can find no further information respecting the interior country, beyond the general notices of superficial travellers; and having also lost my pilot, I must be even more brief respecting the northern shore. Notwithstanding the large portion of this country which is occupied by mountains, it is impossible that Spain can be exempt from Malaria, even all through its interior as well as its sea coasts; amid its confined vallies, and by the banks of its numerous rivers. Of this, indeed, we find casual evidences in abundance, yet none that I can quote with satisfaction; while, though this splendid, but ill-fated country is not deficient in philosophical writings, I have not had the good fortune to discover any work even alluding to a subject which has formed almost a source of occupation for the authors of Italy. That the wretched state of medical science in Spain may be the cause, in some measure, of this neglect, is not improbable; since this country is not wanting in statistical writers; while this is a branch of statistics which seems, by a sort of tacit consent, to have been left to a profession, which, surely, has not done it any very great justice, any where.

For the purpose of preserving the coast line in this sketch, I may take up Portugal from this point. That the shores and the valley of the Tagus are highly insalubrious, and particularly about the salt marshes and manufactories, is now familiar; while the unhealthy region extends far up this great river to Santarem, Abrantes, and far beyond it, so as to extend in this direction into Spain, even as far as Truxillo. If Lisbon itself is exempt, as is the high and irregular land on the opposed side of the Tagus, the insalubrious country commences with the plain on the right bank, while, on the left, it extends far through the level or open country from Aldea Gallega. On the right, towards Abrantes, Golagao is peculiarly notorious; while at Azambuja, and thence to Santarem, lies that proverbially pestiferous region, of which the very name excites terror. Nor is the Douro exempt, and still less the watery country of Entre Minho and Douro; while a hundred separate spots along this shore, which it would be tedious to name, reaching even to Ferrol, and all of them the exits of rivers or the mouths of valleys, attest the universality of a general rule which will always be a safe guide in forming a judgment on this subject. The same is true of the whole shore of the Asturias, from St. Sebastian to near Cape Ortegal, though the narrow or scattered extent of plain in this tract, and the general hilly nature of the country, confines the insalubrity to different very limited spots, and, as usual, to the seats of rivers generally; while I may also remark, that the peculiar ventilation of the whole of the Atlantic shores of the peninsula, united with, and partly regulated by the positions and altitude of the mountains, renders all this division less virulently unwholesome than the similar situations within the Mediterranean.

With respect to the extent and the localities of the Malaria in France, I must commence by regretting that I have lost my guide as to the sea coasts, and that, as I formerly observed, I have been disappointed in the expectations which I had formed from Monfalcon's work. But however imperfect this sketch will therefore be, I shall probably still surprise those of our own countrymen to whom this subject is new, and even those who, acquainted with the evil reputation of Italy on this point, and perhaps not a little guided also by the association of terms, are almost inclined to think that Malaria is an exclusively Italian substance as it is an Italian word.

I may commence, as before, with the sea shores, and by the general assertion, requiring in reality but few exceptions, of which Cherbourg is one, but of which St. Malo is not one, in spite of its apparently promising situation, that from Dunkirk, or, in strictness, as to present France, from Calais, there is not a sea port on the coast, as far as St. Brieux, where a stranger can remain in summer, or rather, after July, without the hazard of fever. That the residents comparatively escape, is only a consequence of what I have fully explained, as far at least as it is explained, in the medical part of this work: but it will be found that every flat situation on this long line of coast is unhealthy, though the degree of insalubrity is far inferior to what it is within the Mediterranean.

Not to be unnecessarily minute, the insalubrious nature of the land round Calais is quite notorious: and though Boulogne is infinitely less hazardous, there are many English residents who have had to repent the day when they chose this as a dwelling place. To pass over many other places, the same is true of the mouth of the Seine, generally, as at Havre and elsewhere; and of many of the situations along the whole of this shore, as far as Carentan, including Pont L'Eveque and Caen; while, within the land, the Malaria, to that moderate degree, compared to Italy, with which it affects this north coast of France, extends into Normandy in numerous places along the courses of the rivers, and through the flatter and fertile plains; as is the case, among others, with the valley of the Auge.

But on this coast, the most pestiferous tract is one, of which Avranches and Dol may be taken as the principal points, since the higher lands and shores of the promontory escape for the most part; nor, as far as relates to inveterate tertians, is this marshy and flat district of Normandy excelled even by Holland; the whole bay, in fact, at this part, being a pest-house as to endemic fevers; and even these less poisonous portions of France being subject to occasional severe epidemics, as I have had formerly occasion to notice respecting Bernieres.

With respect however to many of the towns and places along this shore, it is surprising, and sometimes not unamusing, to find how this truth is suppressed or denied, as is so generally the case everywhere; so as to mislead all but a physician, intent on this subject, and not to be deceived by what, if he knows it at all, he is always prepared for. It is only "la fievre," or "la fievre du pays," or "la fievre tierce:" while the English visitors or residents, ignorant of the subject, not uncommonly of every subject, perhaps incredulous or contemptuous, holding aloof from the people, or unacquainted with their speech and manners, and moreover, from that "morgue aristocratique" which is the effect of what foreigners satirically call an English education, despising and overlooking the People everywhere, remain ignorant of the diseases in the midst of which they are living, till their own turn arrives to suffer; even then not understanding that the "fievre du pays" is the fever of Malaria, but attributing their misfortunes to eating figs or drinking French wines, or occupying a damp house. If I have, more than once, found a whole country suffering from these diseases, where I was previously assured that Malaria was unknown, I have acquired a right to be incredulous as to the salubrity of many places, where, nevertheless, I cannot at present prove the existence of this plague.

The coast of Brittany has the reputation of being exempt as far as Brest; and I cannot prove the contrary, however I may suspect the river of Morlaix among other places; but assuredly it cannot be free from pernicious ground within that bay, nor at Quimper, nor in the Morbihan; as it certainly is not at L'Orient and Vannes, though the whole evil fame is swallowed up in the terrible repute of what is properly called Basse Bretagne; a tract of great extent along the shore, and reaching inland even to Rennes, so as to occupy a great portion of the departments of the Morbihan, Ile et Vilaine, and the Lower Loire. What Nantes itself is, in this respect, is now well known, even to our countrymen who have thought fit to resort to it for economy—and for climate.

Such is the character also of La Vendée, not only along the coast but in the interior; Beauvoir sur mer and Lucon being peculiarly notorious: and as we draw towards the south, the fevers also assume a character of greater malignity, while further, as in Italy, which France now begins to emulate in all points of evil, becoming frequently and severely epidemic, in autumn, and after peculiarly hot seasons. Nor is it otherwise from the mouth of the Sevre to the Gironde; Rochefort being noted for its insalubrity, as is Brouage, and as are considerable tracts on the Charente: while a great portion of Poitou in the interior, is among the most notedly pestiferous districts in France; being nearly connected with a very extensive range of the same kind, as will appear more particularly hereafter in sketching the extent of Malaria on the Loire. Hence to Bayonne I am unacquainted with the coast; but a recent epidemic mortality at Bordeaux, which I had formerly occasion to mention, is sufficient to prove that this is not the salubrious spot which it had been reported by our countrymen. I am indeed informed that great portions of that extensive and well known district called the Landes are extremely insalubrious, not only on the coast but in the interior; a circumstance exceedingly probable from the peculiar character of much of that singular country.

With respect to the Mediterranean shore of France, I may almost say that it is one entire range of Malaria from the Pyrenees to the Alps, and in some places scarcely less pestiferous than the worst parts of Italy. Such are the salt marshes of Peccais in Languedoc, and very universally the whole tract of the Bouches du Rhone, among which Camargues is especially notorious, to a very great extent in the interior; since, as I shall presently show, this pernicious region reaches even to the junction of the Saône at Lyons, and beyond it. The coast of Provence, between Marseilles and the mouth of that river, is similarly bad, as is the interior tract in this particular quarter; and, on the other side, Narbonne is not less noted for its unhealthy climate.

On the Italian side, Frejus seems however to be nearly the boundary of this region: but if Montpelier has escaped this evil reputation, among some other places, it is somewhat difficult to believe its claims, when Cette is as unhealthy a place as can well be; though it must be allowed, that on the principles formerly explained with regard to the resistance of towns, the greater cities may here be exempt, while the smaller ones and the proper country suffer. But I need not be more minute as to this shore; since no one can look at its topography, almost even in a map, or visit any one town, or examine the population, without being convinced of the fact, and without also becoming speedily aware of the extent of the evil. In as far as Toulon and Marseilles may escape, it is partly owing to the magnitude of those towns, but partly also to the form of the land for a certain space along this shore: and thus, in some other places, where there is no margin of flat alluvial land, or where that is very narrow while the towns are situated on the declivities, the insalubrity is comparatively small, or is but casual, or is experienced by those only who may be engaged in these deleterious spots.

To proceed inwards from the mouth of the Rhone, I believe I need scarcely say that Avignon is included within this unhealthy country; as its character is now tolerably well known to travellers. Thus does the Malaria attend us in our progress along the river, and on both sides, even to a considerable extent laterally in many places; numerous and considerable tracts of this nature occurring in particular in the department of the Isere, and also in those of the Drome and the Ardeche. But to pass over many individual [illegible] whom I [illegible] will be given in a [illegible]

[illegible] which [illegible] along the [illegible] commence almost with the [illegible] will scarcely [illegible] and the [illegible] It is here that the notorious plain of Forez lies; while about Montbrisson and St. Rambert, there are not less than four hundred and fifty lakes and pools, together with many marshes, such as that of Ailland. The whole of this tract is scarcely habitable, except in winter; since the bad air rages even from April to November, forming a larger season of disease than what occurs generally in Italy; because, at Rome, that scarcely commences till St. John's day. The fevers are eternal, and consist chiefly of never-ending tertians and quartans; while the people are universally stupid, indolent, sallow, apathetic, and more like walking skeletons than living men; becoming old, if they live so long, at forty-five, and entirely decrepid if they survive beyond fifty. The population thus dies off rapidly, requiring perpetual renewal; yet even in a region so utterly mortal as this may safely be called, the high wages maintain an unfailing supply of emigrants; so thoughtless is mankind.

Pursuing the same course, we find the similar district of Brenne in Bas Berry; the same land of lakes and fevers, and if worse can be, worse. The children, here, are ill even from their birth, and often die of the diseases of the climate before they are seven years old; while the general population, living a life of misery, scurvy, dropsy, and fevers, becomes old at twenty; very few reaching the extreme old age of fifty.

If the banks of the Loire smile in the imaginations of those whose knowledge is derived from poetry and romance, if Sterne and his Maria have enticed many a wandering Englishman to breathe its zephyrs and listen to its pipe, and—to lay up a long stock of bitter repentance, let future speculators qualify the page of fancy with those of Monfalcon, ere they trust themselves to its seductions or to those of its ally, the Cher. It is here that he will detail to them the delights of Sologne, fit rival in attractions to the Maremmas of Tuscany and Rome.

This most detestable tract occupies a superficial space of about two thousand three hundred square miles, chiefly in the department of the Loire and Cher in the Orleannais; reaching from Blois to Henrichemont, and including some tracts near Orleans and Gien; thus forming a large oval, beset with marshes and pools, and chiefly so near Orleans and Romorantin. What the diseases are, and what the misery of the people, I need not repeat, since it is but to tell the same tale again; while, on different occasions, in various parts of this entire work, I have named this very tract as evidence or otherwise relating to the subjects under review.

I need not pursue the Loire to Nantes, where I formerly left off; since, if there is no pestilential tract of equal integrity and magnitude with that which I have just described, the same character of country occurs along the whole course of that river, and often to a considerable extent from its borders. Thus also Poitiers, as I lately suggested, is the center of a district not less insalubrious than many others which I have here described, if less extensive and united than Sologne: but the truth is, that with respect to the interior of France, so numerous are the tracts and spots of this nature, from the peculiar character of the rivers and the distribution of the land, that an entire catalogue would form almost a geographical grammar of the country; while my object here has been to select those places which are most notorious, or which, as the resort of English residents, seemed to demand an especial notice. I must not however conclude without remarking, that there is a great extent of insalubrious country in the department of the high Garonne, and also, to make a somewhat sudden transition, that while the Seine is a guide to many similar tracts, its influence extends widely above Paris and over the country about Laon.

Respecting Flanders, I know not that I could say any thing which is not already familiar to every one, while the land here speaks for itself; and as to Holland, its name alone must serve, since it is the land κατ' εξοχην of Malaria and fogs. Of Germany I am ignorant, at least as far as details are concerned, as the non-German world at large appears to be; but it requires little reading to know that the flat and marshy tracts along the banks of the Rhine at least, and many also of its towns, among which I may name Oppenheim, may compete for the palm of fevers with Rome or Holland; while as far as the Danube is German, it is also productive of numerous unhealthy tracts. In Switzerland, I already pointed out the suspicious lakes and meadow lands; and if, for this country also, I can not find many specific details, I can, from Zimmerman's authority, accuse the canton of Underwald, and particularly Stanz; where an epidemic fever of this nature was so severe in 1717, that the patients very commonly died in the second fit. It would be abundantly easy to divine where Switzerland, and Germany also, are insalubrious: but

I have chosen to make this chapter a record of ascertained facts, since any reader, versant at once in physical and political geography, can easily do for himself all that I could do for him.

Henceforward indeed I must contract altogether; since I can discover nothing but a few casual notices in books of travels and statistics; willing enough to leave to others the remainder of a somewhat wearisome task and no very lively chapter. But there is a general accusation against the whole of the shores of the Baltic; against Denmark very widely, and especially also against Samogitia and Courland; while Stockholm is familiarly known for the severity and inveteracy of its intermittents; so little is a northern latitude a security, where there are wet lands and a hot summer. The marshy forests of the Kama and the Viatka in Poland, are equally notorious; and it would appear indeed that the fevers of Malaria abound in great severity, generally, through all the woody and marshy regions of these countries, even when placed far to the north; since even Lapland itself does not appear to be exempt.

If we approach the southern provinces of Russia, it is to reach a country than which none more pestiferous exists in Europe, and scarcely indeed in the tropical climates; since such is the history of the country of the Don, and of the Crimea, as of Bessarabia and the Turkish provinces here, or generally, of the whole of the flat and marshy lands which border the great rivers and the Black sea. The death of Howard would have rendered that country notorious, even without the travels of Dr. Clarke; but as I must here end with Europe, for want of the means of pursuing it further with that minuteness of detail and validity of authority which form the grounds of this chapter, I may remind the reader of Moldavia and Wallachia, formerly noticed, and of Hungary, the grave of armies; the latter country being, over large tracts, marshy through half the year, and when drying, producing the same effects which arise in Africa and in the East from that cause.

I might detail the geography of the Malaria of America at considerably more length, since the information here is more perfect, but that I am unwilling to extend a chapter, the length of which is already formidable, and since it is, practically, less interesting than the countries especially frequented by our travellers, to which I have, preferably, given the room which I could spare. Generally therefore, I must observe, this [illegible] the Canadas, in summer, every where along the shores of the great lakes and rivers; the character being commonly that of inveterate intermittents: while, whether Lake Erie is worse than the others or not, it has the worst reputation, as have, elsewhere, the banks of the Mohawk river, and the Genesee. With respect to the United States, formed of alluvial land as they chiefly are, Volney remarks, that out of a space of three hundred leagues, he did not find twenty houses free from the fevers of Malaria; the most distinguished places, nevertheless, being the course of the Ohio, rendering even the interior State of Kentucky insalubrious, the towns of Norfolk, Charleston, New York, Philadelphia, New Orleans, Savannah, and Pensacola, with Baltimore, and almost the entire States, in fact, of Virginia, the Carolinas, Georgia, the Floridas, and Louisiana.

Such are the United Provinces of this great country; while in many of the southern states, the evil has, for some time, been so rapidly increasing, as almost to threaten the abandonment of the lands; the proprietors having, in reality, in many parts, been obliged to quit their houses and estates and retire to the towns, even against an express law which compels their actual residence; thus leaving them to the superintendence and occupation of their slaves, and offering a strong argument in favour of a black population at least, if not of an enslaved one. But to cut short this portion, the same plague is found to prevail very widely even through the extreme interior, and amid the newly settled or still uncleared lands, along the course of the Mississipi and its endless tributary streams; to the no small surprise and the serious grievance of the numerous settlers by which such a state of things was not contemplated. What the fate of much of this new country may ultimately be in this respect, it is difficult to foresee, when we reflect on the numerous circumstances already stated, which modify the production and propagation of Malaria, and where so much is yet to be done as to alteration; though it is to be suspected that no changes and no cultivation will ever bring into a state of salubrity, a country so abounding with alluvial plains, even in the interior, and so extensively the produce of its numerous and enormous rivers.

Familiar on this point as are the West Indian islands, and well known as are even their pernicious spots, I need only name Jamaica, St. Lucia, St. Domingo, Martinique, Dominica, and St. Vincent, as the most remarkable; while Spanish America, commencing with Vera Cruz and ending with Acapulco, would itself furnish a catalogue almost commensurate with its sea coasts, and which I must therefore pass over. For the same reasons, an enumeration which would scarcely end, I must omit all notice of the other two great divisions of the world, and terminate a chapter which some one will perhaps hereafter be tempted to convert into a book: a work which, however unamusing to himself the labour may be, or however dull to those who may not be called on to profit by its advice, will reward the author with the conviction at least that he has done good to many, and made himself useful in his generation.

If I have here omitted to notice the insalubrious parts of our own country, there were many reasons against the attempt. The more notorious ones are familiar to every one who has the slightest topographical knowledge as to his native land; while, to execute it in such detail as to render it extensively, or really useful, would in itself demand a small volume. And if, moreover, it could scarcely be executed by any one without a very minute investigation, and without a peculiar species of topographical rather than properly geographical knowledge, the attempt would not only be offensive to many individuals, but might possibly prove injurious to some; as I formerly suggested in excuse for my own suppression of necessary evidences. Offence at least could scarcely be avoided; when the phlegmatic Middleburgher rouses all the indignation which his Boeotian feelings can muster, to repel the insulting notion that the three or four thousand victims to his September days have been sacrificed to his odorous ditches. And whatever proof such a topographer might produce, to show that his object was to save human life and diminish human suffering, it is more probable that he would be contemplated as the satirist of his country, the unsolicited censor of sewers and drains; an alarmist in the eye of the world, however willing, himself, to bear all, and to wait for the day when, whatever scorn he may have endured, his labours will have become profitable to those on whose account they were undertaken.

CHAPTER X.

On the Nature of Malaria.

If it is a common practice with medical writers to produce the largest dissertations on the subjects which are the least understood, I fear that I must adopt the contrary practice; and thus atone for the emptiness of this chapter by its brevity. Perhaps indeed the best, as the truest account of the nature of Malaria, would be an acknowledgement of utter ignorance: but it is at least my duty to say that attempts have been made to examine into it: a few attempts, to balance a much greater weight of conjecture.

That the poison of marshes consisted in animalculæ invading the body through the lungs, sometimes, I presume, through the stomach also, is a speculation which dates as high as Lucretius, Varro, and Columella, which seems to have been renewed in the days of the microscope, by Kircher and some others, and appears, naturally enough, to have found favour with Linnæus. A mythology somewhat more remote than it would here be convenient to inquire of, found a sufficient reason in the Dogstar; but whether this doctrine gave rise to the malign aspects which served the purpose of a cause to the age of astrological philosophy, it is not worth inquiring. The chemistry which had not yet succeeded in emancipating itself from the planetary influences, and to which the two sweeping, and not less unmeaning terms, salts and sulphurs stood in lieu of the labour of observation and thinking, equally, concluded that the poisonous air of marshes consisted of sulphureous and saline vapours; and if such was a satisfactory explanation to Ramazzini and many more, authority like that could not fail to exert its usual influence. When mechanical philosophy began to apply its doctrines to the human body, there was no good reason why Hoffman should not conclude that the whole secret lay in the diminished elasticity of the air; but this theory, never much respected, seems to have bowed before one of much better fortune, which accounted for the whole by the three terms, heat, moisture, and putrefaction, duly expanded and discussed. A theory of much better fortune, certainly; since it is not yet out of fashion; inasmuch as no small number of modern physicians, easily satisfied as it may be supposed, with words, still attribute the fevers of summer in question to heat and moisture alone; as moisture and cold are equally satisfactory solutions of the intermittents of spring.

A new and a better chemistry very naturally induced better philosophers to seek for a new chemical theory on this subject; and I believe that Volta must be allowed the merit of the first suggestions and the first experiments on this ground. Naturally also perhaps, these philosophers sought the poison in question among the ascertained chemical gases: but the honour which any one can claim is too small to render it necessary to assign to each his gas and his theory. It must suffice, in this very brief sketch, to say that among these persons, are found the names of Baumes, Orfila, Chevreuil, Textoris, Balme; and that the accused gases have been carbonic acid, azote, hydrocarburetted gas, hydrophosphuretted gas, hydrosulphuretted gas, and even ammonia; to say nothing of an yet undiscovered compound of azote and oxygen, called septon.

But justice must now be done to those who have attempted, by the means of analysis which modern chemistry furnishes, to examine the air produced by marshes, and to inquire whether it did not really contain some peculiar volatile substance, or compound and unknown gas, the true source of the evil; since I need not say that the known ones which have been enumerated are not the poisons in question, inasmuch as they can be applied to the body in the laboratory, in a much more effectual manner than nature can ever furnish them, yet without exciting fevers.

The eudiometrical experiments of Gattoni and Moscati produced no results, as might have been anticipated: a more rational mode of experimenting, and for a different object, was attempted by De Lisle, Vauquelin, Julia, Brocchi, and others; and if the problem could have been solved by the analytical powers which modern chemistry furnishes, we might have expected the solution from the hands at least of Vauquelin. It is unnecessary to detail failures, and equally so to describe the nature of the attempts, though rationally conducted. What was considered as animal matter, was found, repeatedly, in the condensed vapour or dew, of the grounds in question: but how far this fact may be connected with what is sought, we can scarcely conjecture. Malaria, like contagion, like odours, remains a problem for future chemistry; nor must we blame those who have been unable to produce results without means.

Thus must I terminate what I need not discuss further, by referring to these authors, those who may possess any curiosity as to the attempts in question: but there remains a portion of this subject, obscure as it is, which must not be passed over; little satisfactory as it is to inquire about the possibility of modifications in any substance, when we are ignorant of the very nature of the substance itself. That question is, whether Malaria can or does vary in its composition or nature, or, in its qualities; whether, in different places or climates, or as proceeding from different soils or substances, it possesses diversities of character.

It is plain that we have no mode of examining this subject but by the road of effects, unless any analogy derivable from contagion can be also drawn into this service. In as far as any *priori* conclusions of this nature might be suggested, from considering the chemical varieties in the plants by the decomposition of which it is produced, I have said all, as far as I know, which could bear on the question; and it does not lead to any satisfactory conclusions. And as I have already noticed this subject, when questioning whether the effects of Malaria in producing, respectively, remittent or intermittent, depend on the mere quantity in which it is applied, or on any peculiar virulence in its nature, having also pointed out such collateral causes as might, by uniting to its action, modify its effects on the body, there is not much remaining to be said in this place.

We may commence by taking contagion as an analogy; but even here, I dare only suggest, that as this chemical compound, produced out of the few elements of the animal structure, does possess many marked varieties productive of as many distinct diseases, it is possible that a compound formed of the vegetable elements may be equally susceptible of diversities capable of producing the different diseases which arise from its action. It may indeed be made an objection to this view, that many of these latter disorders pass into each other, as if the actions of the body itself, and not differences in the poison, were the causes engaged; yet they who will meditate on the facts, as I dare not explain them here, will see that this is not an objection of universal application. And, granting any such diversity, even to a moderate extent, we might thus learn to explain many facts relating to the different action of this poison under different circumstances, which have long been a source of difficulty to physicians.

But, after all, we must come to experience; and I shall here state the few facts of any great importance which I have been able to select as bearing on this question; while I will not again renew the inquiry as to the effect of collateral causes, since, of this, physicians can easily judge; while it will be seen, that, as to some of the enumerated facts, no explanation is afforded by such causes.

If it is as true and as constant as it has been said, that certain countries have a tendency to generate, especially, one mode or variety of marsh fever, while, in others, some other variety as exclusively prevails, it is probable that there really are essential varieties of this poison; since we cannot easily conceive how mere differences of quantity should be so constant, or produce such uniform effects; while we, equally, know not how to explain this on any view of differences in the predisposing or accessary causes, seeing that these must be inconstant in their very nature. Thus, it is said, that tertians prevail in Germany, and quotidians in Italy; that, in Hungary, petechiæ are so frequent in marsh fever as to be a marked peculiarity; that the fevers of the Pontine marshes are noted for the shortness of their intermissions; and that Holland is not less remarkable for the variety of its types than for the slow progress of the diseases. In Spain, as in

Africa and the West Indies, the black vomit and the yellowness of the skin are similarly characteristic symptoms; in some parts of Italy, apoplexy is particularly common; just as, with respect to more remote varieties, there are some districts which seem especially to produce Neuralgia, as I have remarked elsewhere of South Wales, and as is also asserted of certain parts of India and Persia.

I might easily accumulate many more facts of this kind; among which the tendency of Indian and African Malaria to affect the liver, and that of Walcheren the spleen, in addition to its singular effects on the biliary secretion, would not be the least remarkable; as it is also a noted one, that in every year, the fevers of this place are marked by a combination of symptoms which is as constant as it is peculiar. But to terminate, certainly not the least curious part of this subject, whether it will be considered as a proof of essential differences in Malaria or not, I shall end by stating from, I believe good, as it is medical authority, being that of a French physician, that even in almost approximate spots, there are similar permanent differences: the fevers of Walcheren materially from those of Bresken on the e of the Scheldt, and, in France, those of Rochefort being as completely distinguished from those of the Lyonnais.

Thus I must terminate an inquiry which I have not the means of illustrating further, and which must be left to future times and increase of knowledge. Yet I must not conclude without saying, that while some physicians have supposed that animal matter could take a share in the production of Malaria, so as materially to modify the character or virulence of the poison, I can find no facts brought forward which deserve to be taken in evidence. Like the whole of this dark question, this also must be left to future investigation: while it is plain that it forms a very interesting object of inquiry, both as to the philosophy of Malaria and its diseases, and as to purposes of practical utility.

CHAPTER XI.

On the general effects of Malaria upon the constitution of the inhabitants of marshy districts, and on the diseases which seem to be produced by it.

HAD I been writing to the people of France or Italy, I might have omitted a large portion of this chapter, since it could only serve to remind such persons of what is far better known to them than it can be to me; but while I am sure that such a state of things is scarcely suspected by the people of England, however much, as travellers, many of them must be interested in the facts, I have also reason to believe that it is much less known to the medical profession in our own country than it ought to be. For the authorities, I might refer to a host of authors, Italian and French; but I need not here repeat names, of which the most important are quoted in this book for various purposes; while the facts have been confirmed to me, partly by living witnesses in whom I can place the greatest confidence, and partly by my own personal observations. They who may have travelled with an observant eye, in France, Italy, Holland, Sicily, Greece, or America, will have little difficulty in recognizing the transcript of an original which must often have attracted their attention.

It must not be understood that every one of the circumstances, physical and moral, here noticed, occur in every pernicious district; since their number and intensity are proportioned to the quantity or, the virulence of the Malaria, and to other collateral causes which it must be now unnecessary to enumerate; but France and Italy can produce examples, as can also many other countries, where the facts are not exaggerated by the picture of them here presented. And if England is a far more moderate sufferer, it still possesses tracts, and includes people, among which many of the lighter evils here enumerated will be found to exist. Further than this, I need not explain what, without some such explanation, might almost be deemed a caricature, or at least a picture overcharged by the imagination: while the chapter on the geography of Malaria will sufficiently indicate the places where the extremes of its pernicious effects will be found.

That the residence of successive generations in a district of this nature produces a degeneracy of the races, is amply shown in various parts of France and Italy; and never more distinctly than when the inhabitants of the marshy plains and vallies come into immediate contact with a people of the same radical origin and race, inhabiting the healthy, mountainous or hilly tracts which bound or include these. The stature not only becomes reduced, but deformities are frequent; while, anatomically, the bones are found to be affected; their extremities in particular being unusually large and spongy, and rickets, as a positive disease, being also an implicated consequence.

The colour of the skin, and the general superficial aspect of the people in these cases, has never failed to attract the attention of even the most cursory travellers. The former is sallow, or yellow, or else stained with different hues, and, in extreme cases, has even a livid appearance: while, to a medical examination, it is found to pit on pressure; this condition often amounting to absolute œdema, and the muscles being soft, yielding, and unelastic. Such persons have often the appearance of being fat; but this, when it exists, is wanting in firmness, as if a great part of the accumulation consisted of water in the cellular membrane. That varices and herniæ should be common in the same circumstances, are facts which belong rather to the absolute diseases that prevail in the marshy districts. It is also remarked that the hair is flaccid and the beard scanty; while, in the most poisonous regions of France, it is further asserted that pale hair abounds, when, in more healthy places, the very same race is noted for the darker tints. A dull, languid eye, very often also yellow, is a circumstance which has attracted general attention.

An enlargement of the abdomen, commencing sometimes even from the birth, and often rendered the more conspicuous from the slenderness and emaciation of the limbs, is also a feature which no traveller has overlooked; and it is often in itself sufficient to demonstrate the nature of the place where these wretched beings are doomed to live, or rather, as the inhabitants of the Pontine marshes express it, to die. That the very form and extent of the liver can often be traced externally, by the eye, is an anatomical fact belonging to this state of things; while an investigation after death, discovers various diseased structures in that organ, in the spleen, and in the mesenteric glands; together with water in the cellular membrane, and a general enlargement of the whole lymphatic system. In the Pontine marshes, the residents have the appearance of walking spectres; being often also oedematous all over, and thus dragging on a miserable existence through the short term of their wretched lives. That the inhabitants of such districts have a late puberty and are less prolific than in healthier regions, is a fact which has been asserted and again contradicted: yet it is one which could not excite surprise should it be proved.

There is nothing in these pernicious countries more striking to a cursory traveller, than the appearance of age which occurs at a very early period of life. Even the children are frequently wrinkled; and, in France, in perhaps all the worst districts, a young woman, almost even before twenty, has the aspect of fifty; while, in men, the age of forty is equivalent to sixty in healthier countries, both in appearance and vigour; the very few who live to fifty, appearing to have arrived at the protracted term of fourscore. Of personal beauty in females, there appears to be little trace at any time; but whatever may have existed is rarely prolonged beyond seventeen. And the expression keeps pace with all else; being that of unhappiness, stupidity, and apathy: an habitual melancholy which nothing can rouse, and an insensibility to almost every thing which operates on the feelings of mankind in general. A slow and languid speech, a similar languor in the walk and in all the actions, indicate equally the condition of the mind and of the body in these wretched countries.

That the period between thirty-five and fifty is the most hazardous and diseased portion of this diseased and miserable life, is a very general remark in all the regions subject to Malaria; while it is not less generally observed, that those who survive this period, often live to become old; frequently also recovering a certain portion of the health which might have been lost. Of another general effect which has been asserted to exist, it seems reasonable to entertain some doubts; since it is an assured fact, that a high degree of nervous irritability, both mental and bodily, is a frequent attendant upon the chronic condition of the fevers of Malaria. The assertion is, that the people in question are, generally, little irritable, or even sensible; and sometimes, to such a degree, as scarcely to express the feelings of pain, even under surgical operations.

The condition of the mental faculties, whether intellectual or moral, is scarcely less remarkable, while it is more interesting: and if there should appear any exaggeration as to some particulars, or should any special fact, as asserted, depend on collateral causes of another nature, the general bearing of the whole as related of Italy and France, has been confirmed too often by remarks of a similar nature, made in America and elsewhere by very competent observers, to leave any doubt as to the leading circumstances.

That apathy which was just noticed as expressed in the physiognomy, is a character which influences the whole conduct of these degraded and unfortunate beings; often proceeding to such a degree that they are scarcely elevated above the beasts in point of feeling. Seeking solitude, shunning society and amusements alike, without affections, without interest in any thing, they make no exertions to better their condition; not even to avoid the sources of danger which surround them, or to take the most common precautions that are pointed out: while, attached to the soil, from habit or indolence rather than from regard, they will not be convinced of its nature or dangers; fatalists in practice and even in belief, and refusing to admit that there is any other lot in life than that which is their own.

That the general intellectual faculties are degraded, is an universal remark; while, in many places, and very notedly in the Maremma of Tuscany, it is observed that absolute idiotism is common. That such a condition is a frequent result of marsh fevers, and very particularly under improper treatment, is a fact which I must notice in the medical part of this work: but even independently of this, such debility of the intellect seems to be the produce of the insensible action of this poison on the nervous system: a circumstance that indeed might naturally be expected from physiological considerations connected with the general influence which Malaria exerts on the body. And that this condition is even propagated, seems, further, fully proved; so that an universal degeneracy of mind and body both, appears to be the certain lot of those races which a combination of unfortunate circumstances have placed in countries that seem to have been intended rather for the habitations of reptiles and insects than for those of man.

Considering that various glandular affections are the produce of Malaria, it seems an object deserving of further inquiry, whether that hitherto mysterious disease also, the Cretinage of the Valais, may not possess some connection with the existence of this poison; since assuredly no explanation has yet been offered respecting it. I cannot indeed find among the authors whom I have consulted, any facts to confirm an opinion which is only offered as a hint for inquiry; and considering that analogous effects, as well as many other diseases unattended by absolute marsh fever, are produced by the gradual action of Malaria, it is at least a subject deserving the attention of those who may have an opportunity of investigating it, whether for confirmation or contradiction. It is not impossible that those writers who have attributed the disease of the Valais to the peculiarity of its atmosphere rather than to the other causes so often discussed, may have taken analogous views to this: though it must still be obvious that the attachment of the Goitre at least, to mountainous or hilly regions, all over the world, is a difficulty from which we cannot easily extricate ourselves.

Be the explanation of this latter disease however what it may, it is an observation as old as physic itself, that inferiority of the intellectual faculties is the inheritance of those who reside in marshy countries, and in a dense, foggy atmosphere. If Hippocrates attributes to the effect of a salutary air, the very powers of the intellect themselves, the well known proverb respecting Bœotian abilities was not probably without a foundation: while, without apparently borrowing from Greece, a similar opinion has not been less extensively entertained in our own days, and, I need scarcely say, applied to Holland.

With respect to the moral condition of the people in those unhealthy districts, the picture drawn by Monfalcon, is frightful; but as I cannot support it by sufficient evidence from other quarters, it must rest on his credibility; while it must also be questioned how far moral and political circumstances unconnected with disease or its cause, may be additional agents in the production of these effects. Not to dwell on this disgusting picture, I must content myself with naming abortion, infanticide, universal libertinism, drunkenness, want of religion, gross superstitions, as the leading features; besides which, it is further said, and even proved by the police reports, that while murders are common, a large proportion of the cases are those of premeditated and cautious assassination, by poison or otherwise: all the vices, says my authority, being of a mean and not of a bold character. But, while averse to quotation, I am also desirous to refer to a work from which I have been enabled to confirm many of the conclusions which had long presented themselves to myself, and whence I have recently derived a support which I had not found in the Italian writers on this subject; a statement of facts, as well as of opinions or conclusions, which satisfies me that I had not misled myself in those which were, not merely formed, but committed to paper and made ready for publication, long before his book came into my hands. Coincident opinions, thus independently formed, carry with them a weight which cannot fail to strike those who have attended to the nature of evidence.

Of the specific and definite diseases which are the produce of Malaria, or which are endemic in marshy districts, some are now notorious to the whole world, a few appear to me to deserve or require the place which they have not yet received, as its frequent if not exclusive produce, and a few others must rest on the assertions or testimony of the authors by whom they have been thus enumerated.

Fever, continuous or remitting, of an endless diversity of character in different countries and seasons, or, generally, in different circumstances, stands prominent in this fearful list: itself the source, either directly or through its consequences, of by far the greatest mortality in such countries, and the further cause, as it has been rudely computed, of more than half of the natural mortality of the human race. To this may be added intermitting fever, not radically distinct, and almost equally various in its appearances: and those varieties, in both kinds, depending partly on original or essential differences in the simple disease, and partly on a combination with local or incidental and accessary effects, which are often so conspicuous or important as to exceed in consequence the radical disorder, or even to obscure it; and, in some instances, further, so completely, as to have been a source of serious error.

Of these modifications, I could not here even give a catalogue without medical descriptions in considerable detail; scarcely admissible in a work of this nature as far as it may become a subject of popular reading. I may only remark, that it comprises numerous disorders, the real nature, as well as the causes of which have been entirely, and almost universally, misapprehended in our own country; though somewhat better known, yet still but vaguely and partially to foreign physicians. And if, from being thus misunderstood, they have been maltreated, causing a vast mass of suffering which might have been avoided or prevented, it was the course of a long reflection on this subject, and an investigation of

ceral obstructions, and dropsy, under many varieties, are the most prominent of these derangements; but it is the two last, and perhaps the visceral affections chiefly, which excite the attention in those pestiferous regions, or rather, which produce those effects on the appearance of the unfortunate inhabitants that have attracted every eye. This is the mark which is stamped on those fated people, condemned to misery and death through faults not their own: the beacon, which announces to the traveller the lands of pestilence and mortality, which warns him from the seductions by which Nature, through all her productions but man, that only production "which dwindles there," would tempt his curiosity or his stay.

But to those diseases many authors are inclined to add the mesenteric affection, worms, ulcers of the legs, and even elephantiasis; together with rickets, scrofula, phthisis, scurvy, and chlorosis. If the Pellagra of the Italian Alps is different from scurvy, it will also require a place here; but it may be questioned whether many of the disorders of this formidable catalogue are not rather the results of a combination of circumstances easily conjectured, than the proper consequences of marsh fever and dysentery, or the produce of the direct action of Malaria. If, as has also been said, the bronchocele is really the produce of the same regions and causes, the hint which I have just suggested respecting Cretinage may not be so questionable as it might appear at first sight. But respecting a disease which, personally unacquainted with as an endemic, I cannot pretend to understand, I must observe that the authors whom I quote, distinguish the well known Goitre of alpine countries from the one in question, which is considered of a different nature, and often of an acute character; so acute at times, and further so epidemic, as, in some instances, to have brought whole regiments to the hospital in the course of a few days. The frequency of hernia and varix was formerly noticed: and as far as the writers from whom I quote this mortal catalogue can be depended on, I may conclude it with angina, catarrh reaching to peripneumony, asthma, dyspepsia of an inveterate nature, and what is called oedema of the lungs.

Of very much of all this I have no personal knowledge: and I do not think it necessary, nor perhaps proper, to offer such criticisms on it as will be tolerably obvious to physicians; but I have a considerable addition to propose, in the disorders which I have here ranked under the term neuralgia ; a list which, together with its consequences, forming a great variety of diseases, it would be impossible to give with any propriety, for the reasons already assigned in speaking of intermittent and remittent fevers. My medical readers will probably seek it at the end of the subsequent volumes, where it was necessarily placed; while for others, should such there be, I must here say a few words in explanation, that I may not leave this account of the disorders produced by Malaria so imperfect as it would otherwise be.

The Tic douloureux, to use the popular name, is well known to be one of the most painful, as it is one of the most inveterate diseases in the whole nosology; the torment, often, of a long life, and, too often, as incurable as tormenting, while, from whatever causes, appearing to be increasing every day. An attention to this subject for a very long course of years, has proved to me, that, from whatever other causes it may sometimes arise, it is one of the disorders produced by Malaria, and that moreover it is very often a mode of intermittent fever; a chronic disease of this nature, attended by a peculiar local affection.

Further, under this leading disorder of the nervous system, the same course of observation and experience has induced me to arrange a variety of painful affections formerly very differently considered, but of which a few have recently been thus classed: hence causing me to constitute Neuralgia as a generic affection, or a subgenus of intermittent, and the head of a very extensive list of diseases, hitherto much misunderstood, and with consequences which will be fully apparent in the medical portion of this work. Such, not to enumerate the whole, are Sciatica, Toothach, Headach, together with other affections, painful, or nervous, which have been often considered mysterious, and of which the cure, like that of all the preceding, has consequently been difficult or impossible. Thus also, and under evidence which will be, as I trust, made satisfactory, it includes many inflammatory disorders; chiefly chronic, which have been too often the torment of patients and the opprobrium of physicians. And if I have just noticed paralytic and apopletic affections as appertaining to the diseases of Malaria, and in connexion with marsh fever, they will also be found to be sequels of Neuralgia; as are, under various and peculiar circumstances, fatuity, and even mania.

Thus, then, Neuralgia, like intermittent or remittent fever, takes a principal place in the disorders produced by Malaria, or by marshes; while it forms an entire and most important class, the causes of which have hitherto been unknown, and comprises numerous and serious diseases, of which even the generic character has been unassigned, and the nature and treatment almost invariably mistaken.

These therefore form the last division of the disorders dependent on Malaria; while entirely unnoticed as such by foreign or former writers, even by those who have treated especially of this subject. And if I could not therefore avoid pointing them out in this place, I regret that I dare not here do more, and that I must inevitably refer to the medical portion of these volumes for that which forms so large a part of them. I shall only add, that if the consideration of the neglected varieties of intermittent was a main inducement to the production of this work, it was the study of Neuralgia which originally led to the whole inquiry; to that primary course of observation and reflection, of which the remaining results will be submitted to the medical reader in the subsequent volumes. To proceed to another branch of this subject.

As dependent on this state of things, it will be interesting to give a sketch, which can however be but brief and slender, of the state of mortality in some of these unhealthy countries, as compared with others: a subject which it would be a matter of no small curiosity to investigate in greater detail than I can afford to do in an essay of this nature.

It might perhaps be anticipated that under such circumstances the population would gradually so diminish as to produce sensible political consequences, or even to be exterminated altogether. Thus it indeed certainly would, were it not for immigration; since, as will presently be seen, the deaths far exceed the births: and in reality, in certain parts of Italy, if the inhabitants have not literally been destroyed or exterminated, a partial result of this kind, added to emigration or abandonment, has produced, as is well known, the effect of absolute depopulation.

But in many places, and in the worst parts of France very conspicuously, the value of these lands for pasturage, for agriculture, or in fishing, affords a constant temptation to new and healthy settlers, destined in no long time to run the same course, and again to be replaced by fresh adventurers, to whom land or labour is always open in consequence of the extraordinary mortality; while the stupid and apathetic character of the fatalists by whom such tracts are inhabited as their birth places, prevents them from leaving a soil which they scarcely will believe to be unwholesome; thus giving the semblance of that blind attachment to their native marshes, which poets, as blind, have lauded, as poets use, and in other cases than this.

On this subject also, it is a preliminary remark worth making, that no where are marriages more numerous, more blindly entered on, and, very naturally, more frequently repeated; since, on the doctrine of chances, the condition of widowhood, on one or the other side, cannot fail to be frequent. More women, it is true, are re-married than men; as, from obvious circumstances, the mortality on the latter side is greater; nor is it uncommon for one woman to have had three, four, or even five husbands. On the other hand, it has sometimes been known that one man has married that number of wives: the tale being told in Bresse (if I am not mistaken) of three brothers who had married, between them, fifteen women. This system of survivorship, however the balance may lie, is explained by the fact, that the polygamous individual is commonly a native of the country, and the mortal associates immigrants from healthier districts: and thus has it been said, not only in France, but among ourselves in Lincolnshire, that speculators on such survivorship choose their partners from the healthy neighbouring lands, and thus, of either sex, often accumulate the fortunes of successive victims. In addition to the natural temptations arising from vacancy, whether of wives, husbands, farms, or labour, I need scarcely perhaps remark, that such marriages are often, in addition, the result, not merely of a prevailing libertinism belonging to the depravity of the moral character and the fatalism of these countries, but of that recklessness which is so noted an attendant of poverty everywhere, and very familiarly, in Ireland; and which, in circumstances, analogous, though far from parallel, leads the seaman over whom death is impending from the surrounding rocks, to plunder and forget himself in intoxication.

If the few statements which I can here afford to give respecting the mortality in question, are apparently at variance, it is chiefly perhaps because that varies itself, materially, in different places; while some have derived their results from one country or district, and some from another. For the present purpose, it is unnecessary accurate or critical; and a few remarks of this nature will suffice. Whoever desires to know fully these computations and their grounds, can easily refer to the authors whom I have here quoted, and to many others whose names are familiar to those acquainted with political arithmetic.

The mean annual mortality in these cases, as computed by Dr. Price, gives an average of twenty-five years of life, founded certainly not on the most unfavourable facts; while Condorcet, from other, and apparently worse situations, places it as low as eighteen: a conclusion in which some exaggeration may be suspected, unless he had selected some peculiarly unfavourable case. In Bresse in the Lyonnais, it has been computed as varying from twenty to twenty-two. These are examples enough, perhaps; and it will be remembered that a mean term of life in the countries of Europe not subject to the plague of Malaria, is found to extend from forty-five, upwards, to a period, as to our own country, which has now, and assuredly had for some time past, extended to a considerably higher average.

With respect to the extreme term of individual life in such cases, it is stated by many writers, that in Egypt, and in Georgia and Virginia, in all the marshy situations, it does not exceed forty;

exceptions being of course understood for specific cases: while Jackson asserts that at Petersborough in the latter province, a native and inhabitant rarely obtains the age of twenty-one. In France, Rozier places this extreme limit, for those portions of Britany which adjoin the Loire, at fifty; at which age the individual who has escaped thus long, equals a man of eighty in healthier countries. In various parts of Italy, Sicily, Sardinia, Corsica, Wallachia, Moldavia, Hungary, life, whether computed in this last or in the preceding manner; presents a still more unfavourable aspect; though perhaps under the circumstances of misery beneath which this burden is borne, that shortness is a blessing rather than an evil. But not to protract this manner of contemplating so fearful a picture, I may now place the same facts in a different light, that travellers who may interest themselves in this question, may see how, under one or other of these modes, they may direct their inquiries.

In the Commune of Chatillon, (Orleannais,) in ten years, there were 1845 births and 2046 deaths; or the annual average was 184 of the former to 204 of the latter nearly; giving an unfavourable
rtion of nearly one to five. This is an ex-
of a very unhealthy district, though far

inferior, still, to many parts of the countries which I have named above; and if the general probability of deaths is taken at 28 in 1000, it rises here to 51. Similarly, in Brenne (Berri,) Sologne (Orleannais,) and Bresse (Lyonnais,) the deaths far exceed the births; though Monfalcon, from whom I have borrowed this general fact, has not given the calculations. In the latter district, however, the registry shows that the term of individual life, considered as longevity, ranges from thirty-five to fifty; while the survivorships at this latter limit are very few, as it is, there, extreme and rare old age. How all these proportions stand in the Maremma of Tuscany, in the neighbourhood of Rome, on the Calabrian coast, in the Mantuan, at Syracuse, and in many other parts of Italy and Sicily now familiar to so many of our countrymen, I need not say, as they are generally known to all who have had any communication with those regions.

A few further facts, from the unhealthy tracts of France, resting on the authority quoted above, will complete all that I dare take room for in this sketch; while by placing in these several lights the effects of the Malaria, the extreme importance of the whole question will become more obvious to those who, living in comparative security, are commonly as incredulous and ignorant as they are thankless for the better lot which they have not so exclusively merited.

In spite of immigration, as well as of a rise in the value of lands, the population of Sologne (Orleannais) has diminished two-thirds in the space of a century and a half. The town of Villars in Burgundy, within a century, has been reduced from eight hundred houses to a wretched line of a few cottages; and the same kind of reduction has taken place in many other towns and villages in this most miserable country. In ten communes, the diminution has been one-eighth in twenty-two years, while the general wealth, agriculture, and population of France at large have been undergoing a rapid and marked increase.

I might easily have extended this particular set of facts by similar notices as to many other portions of the same country, so little suspected hitherto by English emigrants; or rather, I may say, so little suspected even to this hour, that the catalogue of their sufferings from that cause, from a rash choice of residence chiefly, would in itself make a formidable appearance. I might equally point out the similar diminutions, often the absolute extermination or abandonment, of many portions of Italy; but these are so well known to every one who has even the most common reading respecting that unfortunate country, that it would be merely to repeat what all the world knows; while also, in other places and for other purposes, I have had occasion to allude to those facts, and, very particularly, to describe the singular and fearful condition of Rome.

I will therefore terminate this very brief sketch of the general effects of Malaria on the residents in marshy or unhealthy regions; a subject which might well be extended to twenty times the length, with instruction perhaps for which my plan allows me no room, and with amusement, I doubt not, in which I must not indulge. This short notice will have answered its purpose if it shall assist in enlightening or convincing the ignorant and incredulous; in holding up to their eyes the great enemy of the human race, the very Destroying Angel to whom the task of keeping man within due bounds has been especially assigned; if it shall convince them that the subject which I have here brought before them is worthy of their knowledge, inasmuch as they are not, even in this more fortunate island, exempt from danger and from mortality through this cause, and inasmuch as it is in their power, by care founded on that knowledge, to diminish or avert the evils which it produces among ourselves, and, however little that may at present be suspected, in no small proportion.

It may be thought a question of mere curiosity whether other animals than man can be affected by Malaria, or suffer diseases analogous to those which it produces in us: but the solution of any question of this nature is valuable, since we can never foresee what light may not be thrown on physic as a science, from facts relating to the diseases of the inferior tribes. It is to France and Italy chiefly that we owe what information there is on this subject; since, like every thing else appertaining to the history and effects of Malaria, it has been neglected in England; though I must make one exception at least in favour of Mr. Royston, who alone seems to have been led to make the same remarks in Cambridgeshire. The general fact is, that cattle, or animals of different kinds, do become sickly or diseased in the same situations which produce the diseases of Malaria in the human race, and that the consequences are as resembling or analogous as they could be under the differences which exist.

On this subject, and as it relates to Italy, Lancisi is one of the strongest as of the earliest authorities. He remarks, as many others have also done, that in the Roman states, in marshy places and in summer, epidemics, or epizootics, are common among the cattle; and though the descriptions of the disease are not very satisfactory, the dissections, by his account, display exactly the same appearances as are observed in men who die of marsh fevers. This fact, of the appearances on dissection, has been confirmed by various observers in the Milanese; and also in Egypt, in Hungary, in St. Domingo and Gaudaloupe, as well as in France, at Rochelle, and in Auvergne and Roussillon. The connection between seasons of peculiarly severe epidemic marsh fevers in man, and of epizootics in cattle, is particularly pointed out by Bailly, of the year 1812 at Arles; and in this instance, the inflammatory affections and the subsequent disorganizations proved to be the same in the animals as in the people dying of the fever.

Analagous observations have been frequently made in Italy: and not to quote more than is necessary, the years 1711, 1738, 1745, 1772, 1783, and 1795, are among those which have been particularly recorded for epizootics among cattle; each of them being also noted seasons of epidemic fever, or of the prevalence of Malaria. Further, they all occurred in the months of August, September, and October, and were also confined to the marshy or unhealthy districts; while it was in addition remarked, that the cattle introduced from the hilly and healthy countries were those that suffered most, as men are known to do under similar circumstances, and that, very particularly, those oxen were most frequently and severely affected which had been employed in ploughing up the pasture lands; an operation which, as I have remarked in another place, is generally dangerous to the human race, disengaging, or giving rise to the production of Malaria.

The fever or plague of black cattle, not uncommon in certain parts of France, if rare with us, is attributed very generally, by the veterinarians of that country, to Malaria; and of remarkable instances of this nature, one is noticed by Chaignebrun, occurring in summer, in a marshy tract in the forest of Crecy, which destroyed about three-fifths of the cattle attacked; the number of the last being nearly 500, and the disease being described as a typhus with effusions into the thorax and abdomen. A similar fact is related by Petit, of Auvergne; and it is remarked by Guersent, that all the fevers of this nature occur in summer and in marshy situations. In other districts, a similar fever in cattle has been found attended by inflammations of the lungs, and in horses, of the throat; while dropsy, probably from a previous fever of the same nature, is common in sheep. These latter animals are said to be subject, in the Orleannais, in the department of the Loire and Cher, already quoted as one of the most pestiferous tracts in France, to such frequent epizootics, that it is necessary to renew the races every ten years, while they degenerate from the moment of their introduction, and present at all times a miserable appearance.

To such a cause we may also probably refer the asthenia ossifraga, as it was called by Paulli, occurring among sheep in Smoland, and by him attributed to their eating the Anthericum (Narthecium) ossifragum; though Linnæus has rejected the whole as a popular tale. I need not say to botanists that this is a native of marshy soils, and that the general views here held out will probably explain, in a similar manner, the popular opinion of the production of diseases in the same animals from feeding on the Hydrocotyle vulgaris; a plant which, it so happens, they will not eat.

Independently of absolute fevers and death, the general health of the cattle and sheep in all these marshy districts seems to suffer in a manner analogous to what it does in men; nor can that be ascribed to want of food, nor even to improper food; as the pastoral, and very often the agricultural value of these poisonous districts is considerable, often indeed temptingly high. In Brenne, (Bas Berry,) the cattle are weak, stunted, dull, and, as it is said ricketty; while it is remarked that they are subject to a chronic state of fever, attended with a slight inflammatory condition of the bowels and lungs. In the Orleannais, black cattle are difficult to rear, and are stunted in their growth, degenerating, like sheep, in the first generation; and this is remarked of other places, by Bosc, both with regard to cattle and horses, though the latter animal seems to offer greater powers of resistance to the poison, thriving often where sheep die. It is also remarked that in such districts, the animals in question, and the sheep in particular, are less prolific. It is further observed in France generally, that the flesh of animals in such situations is bad, or flavourless and watery; and this fact is confirmed by what occurred in Sicily, well known to our armies when occupying that island; namely, that the beef was similarly bad if procured in the country, but that when the Sicilian cattle were transported to Malta for a few months, it became excellent.

Such are the facts best ascertained as to the influence of Malaria on the agricultural animals; and they seem to leave little doubt that its action on them is similar to what it is on the human race, as far at least as relates to the production of continuous, or remittent, and autumnal fever, with the usual topical acute affections and chronic consequences: to which we may probably add a chronic fever, with, not improbably, obscure or tedious disorganization, or deterioration of functions, similar also to what happens in man; productive of degeneracy and general ill health. If it has been said that geese suffer from feeding in noxious marshes, and that the disorder in this case is an enlargement of the liver, the fact, if true, will present another interesting analogy; but I am not sufficiently satisfied with the evidence, to lay any stress on it. The curious in eating may inquire whether the celebrity of the livers of the Ravenna geese in ancient times was connected with this fact: if indeed it be a fact.

This, as far as relates to the kinds of animals affected by Malaria, seems to be the sum of what is generally known; but I have received information of a similar nature from the West Indies, respecting another animal, so decided as to the asserted fact, and from so many different sources, that there seems no reason to doubt, either the mere truth or its accuracy. It is, that immediately before the season of fevers, the dogs become diseased, as from a fever, or that the epidemic appears in them before it is established among the people: and further, that a season of disease of unusual severity is always expected, in Dominica particularly, whenever the sickness and mortality among the dogs is unusually great. I have obtained no specific account of the nature of this fever, though it may be conjectured that it is a continuous one, like that which, in the same circumstances, commits such ravages on cattle. But I cannot persuade myself to omit one case of the occurrence of a regular tertian intermittent in a dog, because I cannot doubt the medical testimony on which it rests, particularly as the persons in question had no interest in the fact: a suspicion which might easily attach to a writer on such a subject. He who relates simply the conviction of others, removes at least from himself, the claim to credibility. The surgeons in question were those of the island of Guernsey, to whom the animal was submitted for examination; and as the disease continued for some years, the cold paroxysm taking place always at three o'clock, there was ample opportunity of verification.

If this case confirms the observations of Mr. Royston as to the occurrence of true intermittents in the agricultural animals, so is it confirmed by those very interesting remarks; and it is not improbable that if more attention were paid to this subject, if there were more such observers, intermittent would be found not an uncommon epizootic, or endemic in cattle, confirming the analogy already pointed out in the case of autumnal remittent or continuous fever.

On this subject also it is not unworthy of observation, that the remarkable disease of the liver in sheep, commonly called the rot, is the produce of wet lands, and very pointedly, in Lincolnshire, of those fen lands which also generate Malaria; while it does not occur in dry situations, and is, further, cured by removing the diseased animals to such places. In France it is believed to be the produce of the Malaria of marshy lands; though it may be too much to say that the rot is a disorder so produced in all cases; but while considerable ignorance exists as to its true nature or causes, and while the different ones which have been assigned for it are either trifling or unfounded, there is at least nothing to oppose to such a supposition, and the question remains open to inquiry. It is far from impossible that the poisonous atmosphere which acts on man in producing so many diseases, should also act similarly on animals; on the contrary, we should have decided that this was a general probability, had not experience shown how many inheritances of this nature man possesses to their exclusion. But as there is no law which rules that man and animals shall not have a common disease, and as there are instances in abundance of the reverse, we are far from having any right to assume, that, in the instance alluded to, that poison which acts so widely and severely on man, shall not also exert a corresponding, or possibly a different, but a morbid action, on some one or more of the inferior animals. With respect indeed both to this disease and to the fevers of black cattle, I am the more confirmed in the opinions here stated, from the answers to some inquiries which I have recently made in Lincolnshire. The general fact as stated in those is, that the several disorders here noticed used to be very common before the drainage of the fens, but that they are now scarcely known; and how important therefore the knowledge of Malaria must be, even in rural economy, is too obvious to require another word.

But to the disgrace of physic as of rural economy, to the disgrace indeed of public economy and of an enlightened and busy age, the diseases of animals are almost utterly unknown, as diseases should be known, with some slender exceptions as to the horse; while, independently of the merely economical question in this case, the very extraordinary epizootics which have been noticed at different times form a most interesting object of scientific inquiry. These sweeping disorders, sometimes possibly proving the production of contagion, assuredly prove at least the production of what must be called a Malaria, for want of another term; since, if we except the case of food, that is, of noxious food or of deficiency, on no other principle that we can conceive, but that of an atmospheric and respired poison, can an epidemic or epizootic exist; the case also of casually abounding inflammations being of course excepted. And if such is the general cause, it remains to be investigated whether such Malarias are produced from land, like our own, and how; and whether also that very species which to us is so poisonous, may not, under particular circumstances, operate equally on some or other of the inferior animals, though with results as to the form of the disease, of a different nature.

It would be out of place however to pursue this very remarkable and much neglected subject of Epizootics; though even as it relates to the wild animals, it interests us in an economical view: seeing that it is a probably assisting cause, as well as inequality of reproduction, in the frequent disappearance or diminution of particular species, in the sea as well as on the land; a fact in which we are often deeply concerned. That such diseases have occurred, and sometimes indeed have been frequently repeated, even within recent recollection, in cattle, horses, sheep, cats, bees, leeches, dogs, and more, is sufficient to show how much they concern us; and that I have, in my own narrow observation, found that extensive epizootics or seasons of extraordinary mortality have occurred in seals, in whitings, and I think in some other fishes, and in sea-gulls, (the kittiwake), while it is a proof of their extent in the animal kingdom, may also serve to explain many of those revolutions in the numbers of peculiar species, even in fishes, of which we have long been amply sensible in the results, without considering the causes; as it may also probably aid in explaining similar and far more noted revolutions in the insect tribes, often of even more importance to us than changes in the distribution or numbers of the more obvious or larger animals. But as I must not here pursue this subject, I shall content myself with suggesting, that while the study of these animal diseases is, in itself and abstractedly, most necessary, it is not impossible that a future acquaintance with them and with their causes, may tend in time to throw light on Malaria as it affects us, even should our own Malaria, if I may so call it, be a distinct variety, incapable of acting on any animal but man.

But there is one circumstance on which I must here insist, before I conclude this essay, and with which I shall terminate what I have to offer on Malaria, or rather, what I think sufficient for the purposes which I had in view; utility; the prevention, and, in some measure, the cure also of disease. It is true that I have had occasion to touch on it more than once; but I consider it too important not to be brought fully and fairly before the reader, that he may at least bestow his own careful consideration on it, though he should not choose to agree with me. It is, in reality, of the greatest importance, because a great portion of the entire question as to Malaria rests on it; that is, in as far as we propose to turn our knowledge to purposes of utility, whether as to the prevention of the diseases originating in this cause, or their cure.

If, of an effect, or of many effects, there is but one cause, we have attained a mastery by knowing that, which becomes materially reduced in value should there be more than one: while should we even suspect additional causes that we cannot prove, there is excited a want of confidence in our philosophical principles, which materially interferes with the results that we might otherwise have derived from them. It is therefore most essential to ascertain, if that indeed be possible, that the various diseases attributed to Malaria are really produced by that cause and by no other; or that, being an unquestioned cause of the fevers which occur in certain situations, it is also the sole one.

I need scarcely commence by saying that he who desires to *prove* this, has undertaken a task which is not merely difficult, but, in a strict sense, impracticable: not only because to prove a negative is almost always an insurmountable difficulty in the less accurate sciences, but because there are to be encountered prejudices and habits, as firmly as they are anciently rooted; and not the less inveterately subjects of belief that they are utterly void of demonstration, or even of proofs of the lowest order. In deficiency therefore of direct evidence or demonstration, there is no resource but to approximate the facts in a simple and logical order, and to trust their effect to those whose philosophical habits empower them to weigh moral probabilities; since, of that nature, must the present exposition consist.

It is amply demonstrated in the first place, that the fevers in question are caused by exposure to the atmosphere of marshy grounds, or to what is here called Malaria; so that, respecting the reality of this cause there is no doubt. But physicians have been in the habit of asserting that they are also caused by heat simply, or by heat and moisture, or by cold under the same varieties; or by fatigue, errors or deficiency of diet, the passions of the mind, and other causes which I need not name, inducing what they term debility.

Now, to pass over the well known maxim in philosophy, that superfluous causes ought not to be assumed, let us first remark, that the period during which these last named or unproved causes were assumed, was that period of medical and philosophical ignorance in which the very existence of the chemical substance called Malaria was unsuspected, and when, as I showed in the last chapter, the effects of marshes in producing disease were attributed to defective elasticity in the air, to animalculæ, to heat, putrefaction, or whatever else there was of vague, fanciful, or unmeaning, which constituted the medical and philosophical language, not reasoning, of that day, and which still forms the far better part of the whole philosophy of physic.

Let us remark in the next place, that the unproved causes in question have been equally applied by physic, and from the earliest and darkest periods, as in the present day, to the explanation of numerous other diseases, perhaps of nearly all the important ones, and to diseases of the most opposite character to those under review. And I should not say what is untrue were I to say, that these have been used, and still are used most commonly, as a mere string of terms, without waiting to consider of their meaning or application: that they are a part of that phraseology which constitutes what is considered as philosophy in physic, and which forms, under other modes, the far better part also of the ordinary—reasoning as it is usually termed, in the several branches of morals.

It is somewhat, in such a case as this, to trace the origin and character of opinions, because we may thus often shake the structure which we cannot directly demolish. Let us next see what the probabilities are, that these causes do produce the supposed effects.

If in respect to the production of disease, a single cause were always sufficient, or always the sole agent, there would be no difficulty in proving that not one of these is the cause of marsh fevers; but unfortunately it happens that the state of the subject of action is too often implicated in the effect, or that two causes or sets of causes must concur to its production. These, respectively, are the exciting and the predisposing causes of physic; or the real cause, and the opportunity afforded for its action: and if there may sometimes be a difficulty in allotting them, the more common event is, that as the latter are commonly palpable, and the true cause difficult to discover, physic contents itself with what is most easy, and thus wanders about among those errors, of which the present case is, I doubt not, an example.

We must therefore try this question in another way, and attempt to deduce out of a broad mass of facts, that conclusion which could not be derived from individual and separate ones; and if this can be done, the point is proved, because it is thus in reality that even accurate philosophy must in most cases arrive at truth. If it can be shown that the one cause here assumed as the true and sole one, acts as often as it is fully called into action, and that the power of the others is irregular and uncertain, still more that there are regular and constant circumstances under which they never do act, and further, that when they seem to act, the real cause is also present or probably present, then does it appear to me that the point will be proved as far as any thing ever can be proved in those sciences which do not admit of mathematical demonstration.

Now it may safely be asserted in the first place, hat the several unproved causes in question, which I need not again enumerate, exist at all times of the year, and secondly, that they exist in all the countries of the world. Or, to be more minute, and to divide them into two classes, those which belong to man himself, such as fatigue, injurious passions, diet, or other causes of debility, are found equally distributed, on a broad average, throughout mankind, everywhere, in all climates, and at all seasons of the year; while injurious conditions of temperature, if less amenable to the same average, occur under rules that offer certain averages also, but which are distinct from those that regulate the existence of the one, and the as yet only proved cause, Malaria.

Now were the first division of these causes the real causes of such fever, it should bear an equal or analogous average throughout mankind, which, I have fully shown, it does not. These human causes, as I may call them for the sake of distinction, cannot therefore be the causes of such fever, because they do not possess the necessary philosophical qualities; and I may therefore dismiss them.

With respect to the second division, or the assumed causes, consisting in temperature, the statement of facts must be somewhat longer, because in the usual lax language of physic, the whole of the circumstances are promiscuously enumerated, and without the requisite discrimination; insomuch that were they really causes of fever, it would be difficult to see how any person should escape; or rather, the whole world, in certain climates, or in all climates, would stand on an equal average, or on certain distinct averages, with regard to these diseases: which it does not.

To distinguish; the operations of temperature must consist in continuous cold, or that which is beneath a low mean heat, to be safely enough taken at 40°, or in continuous heat, or that which is above a high mean, which may be as safely fixed at 65°; or else it must depend on transitions from a high to a low temperature, or the reverse. The partial operation of cold is not worth distinguishing in this case; and with respect to moisture, it seems agreed that its influence is dependent on its relations to temperature. But should it be esteemed a separate cause, it must be distinguished into excess and defect: and thus the whole question as to these causes is cleared for examination.

Now, that continuous cold does not produce marsh fever, is proved, partly because that does not occur in cold climates or in cold seasons; very particularly because it does not happen in winter, even in those places where the proved cause, Malaria, is present, or where at least it would exist if the temperature permitted its production. That continuous heat alone does not produce this fever, is proved, because it is not generated in the dry or sandy tropical climates, where the heat is often more extreme than even in those of a different character. And that neither transitions from cold to heat nor from heat to cold do alone produce it, is proved, because the former set of transitions occur, as they must, in every cold climate, and in some very notedly, on the coming on of spring, yet without producing fevers; while the reverse case, or the transition from heat to cold is, even more notoriously, not simply common, but a daily occurrence, in the burning sandy deserts, where hot days are followed by cold nights, and where, still, fever is not the consequence.

Thus these causes of fever also may be safely elicited out of the enumeration, if reasoning from facts is of any value, if there is any case where the generalizations of philosophy are admitted as deserving of regard.

Now, lastly, with respect to moisture, admitting it as including a separate set of causes, we may first, I believe, safely neglect defect of moisture, otherwise than as it acts in producing cold by accelerating evaporation, and as coming therefore under the former case, since it has not been supposed a cause of fever. With regard to moisture in excess, whether we leave out the case or not of its producing cold by its conducting power, (though I formerly examined that subject in treating of the east wind,) I must partly repeat here, that if it could produce fever by itself, a fog from whatever quarter would be a cause of disease, or an equal cause; that the fogs or clouds of elevated or mountainous regions would produce fever; that this would occur equally in all moist countries, of whatever temperature; that the western Highlands or Cornwall, for example, in our own island, would be more subject to fevers than Norfolk or Lincolnshire; and that, at sea in particular, they should be unusually common. Not to examine separately these cases, it will be sufficient to say that they are notoriously not the causes of such disease, and that at sea, very remarkably, other causes being elicited, fevers are almost unknown. How Malaria is produced in a ship, I formerly explained.

Thus have I gone through the whole of the reputed but unproved causes of fevers, or rather of remittent fever, since I must shortly proceed to a medical discriminating remark on this term: and I must think that had I been discussing a question in any other branch of philosophy than physic, I should have proved my case to the satisfaction of every reasoning mind: proved that not one of these causes was the real cause, or the "exciting cause" of this fever, whatever share they may take in operating on the body so as to render it capable of being influenced by the real cause. But I know physic too well to expect that I shall produce such conviction; since against what is neither logic nor philosophy, philosophy and logic are opposed in vain.

Let me now attempt to shew whence the fallacy arises; while on that I may be brief, since it is but a recapitulation of much that has already been proved.

Fevers abound in certain climates, places, and seasons, where vegetable decomposition proceeds in a rapid or peculiar manner, and they are proved to be produced by exposure to the atmosphere of those places, which is concluded therefore to involve an unknown gaseous substance called Malaria. The causes productive of Malaria being demonstrated, such fevers are proportioned in number and severity to the power of these causes, increasing as they increase, diminishing when they diminish, and when they disappear, disappearing. Malaria therefore, however unknown it may be, possesses all the philosophical properties of a cause; and as I have shown that fevers are not produced where it is not present, though all the other presumed causes are so, these cannot be Causes.

The fallacy is plain; that is, supposing these causes to have been really assigned from presumed observation, and not the mere phraseology which I believe to have been the case. As the causes here called human ones must exist everywhere and at all times, they must be in existence where the real cause, Malaria, is in action. The same is true respecting heat, injurious vacillations of temperature, and moisture: while these, in particular, are causes which bring Malaria into action or tend to produce it. These therefore are either concatenated incidents, or causes of Malaria, or of its action; the causes of the true cause, not those of the effect.

I must leave this train of argument to produce such impression as may be its fate, while I cannot see how it is to be answered: and I need not repeat that the circumstances which I have now attempted to elicit as real causes, may perhaps be allowed to be predisposing ones: actions which are incapable, by themselves, of determining this particular effect, while they aid in the production of many others, even of the most opposite nature.

On these, as predisposing causes, I need not here dwell; the more, that it is peculiarly a medical subject, and does not, in strictness, belong to the matter in hand. In as far as they may act in modifying the character of the diseases produced by Malaria, I have already shewn that it is very doubtful if they do so act. It is a point which, in any view, requires to be investigated, and really investigated: since it is quite time that physic should cease to assert, and commence to prove: that it should re-examine what it has hitherto believed, together with its grounds of belief, and not be content, in these days of a better philosophy, with its ancient dogmas; with that which it believes and acts on from habit, not from conviction, and with the phraseology which it too often mistakes for reasoning.

In how far the circumstances in question predispose to disease at all, is matter for experience rather than for reasoning; since we do not know in what that predisposing action consists. That is, we do not know, truly and physiologically, how the cause acts, nor what are its effects. Generally, it seems proved by experience, that if the body is in an unusual state of muscular weakness, or beneath its average standard of strength, the facility of acquiring certain diseases, and fevers among others, from application of the exciting cause, is increased; and thus has it been said that debility, or causes inducing debility, are predisposing causes. This, however, is but phraseology; it leaves us where we were before: while in the case of the predisposing, or presumed predisposing causes in question, it remains to be shewn in what manner many of them produce debility, or whether they produce it at all. That many of them do not induce sensible muscular debility, is certain; and that this may be present, from numerous causes, without nevertheless leading to disease, is no less certain. Thus it must be feared that we are still in darkness; compelled to rest on certain experienced facts, but unable to determine their nature or their action; and, as far as we use these terms, using them without being able to assign their meaning, or explain our own.

To complete this discussion however as to purposes of utility, I must repeat briefly what I hope I have formerly proved; that the sources of Malaria are far more widely diffused than has generally been supposed, that they can often be truly proved to have been the causes of fever when that has been attributed to fallacious or imaginary ones, and that this poison is probably always the real cause of the disorders under review.

There remains yet the medical question. Were it not the ultimate and essential one, I would gladly have avoided it, because it is no longer a question of reasoning and facts, but of medical opinions and fashions. I must be brief in proportion; and shall be safe in saying, first, with physic, that fevers are proved to arise from two great causes at least; Malaria and human contagion: the latter, whencever arising, enabling the sufferer to reproduce a substance productive of similar effects. And whatever other fevers there may be, from other causes, these two great classes, are, in numbers, as a hundred, or ten hundred, thousand, to one, compared to the rest; while also the fevers from Malaria exceed those from contagion ten thousand fold, or far more.

The question remains. Is there any other simple fever, which is not produced by one or other of these causes? It is believed that there are many; to a certain extent, it is proved: but it is also notorious, that such third class fevers bear a very minute proportion to the rest, and what is of infinite importance, that they are of little moment as diseases, from their little injurious properties. The error has been to consider the slighter fevers from Malaria as belonging to these.

The final conclusion is therefore the following: that when I have, in the preceding investigation of causes, used the term fever as a substitute for the more definite one remittent or marsh fever, I have in reality included the great majority of cases which occur in the world; the very high majority, I should say: and that, excluding of course the contagious fevers, or the second great class, as being well understood, the conclusion which has been drawn as to The Cause, Malaria, in as far as it is a conclusion of utility and not of philosophy, (being all to which it pretends,) remains valid for those purposes of utility.

Can it possibly be necessary, once more, to say to what all this reasoning tends, as to practice or use? If the great proportion of the fevers which occur among mankind, in our own country as in others, are fevers from Malaria, if this is especially true of those which are serious or severe, omitting always the fevers from contagion, then are we in possession of the cause; and to possess that is the first step towards prevention. If further, there have been here truly pointed out the places and circumstances which produce Malaria, or the causes of that cause, and if all these could be avoided or destroyed, then fevers would occur no more. And as far as they have been pointed out, and can be avoided or destroyed, fevers must diminish: since, of other diseases, the consequences of Malaria, I need not now speak. And lastly, if among the fevers now supposed to be contagious, many, the much larger portion, are not of this character, but are truly also the fevers of Malaria, then have we made a most important step as to the prevention of fevers in general, as far as we can diminish or controul the action of that poison. And all this depends, primarily, on our proving the real cause of such fevers, and secondarily, on our proving the causes of that cause; this last knowledge principally, being that which the present researches have attempted to investigate.

I may thus terminate this essay; or, as it will prove to those who desire to seek further, this branch of one subject; which I have unwillingly thus separated from the consideration of the diseases which are its effects. If it is not now as apparent as I hope it is, to what useful ends the facts which it contains may be directed, these will be rendered fully sensible hereafter: while I cannot help believing that even what is here done, will, in the end, prevent a great mass of evil, or of suffering and death; and that the views which are to follow, will also put it into the power, not merely of physicians, but even of the people, to lighten or to avoid numerous disorders much misunderstood; and, essentially, as I trust, to diminish the total sum of human misery.

THE END.